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JOURNAL OF FARM ECONOMICS

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CHANGES IN THE DEMAND FOR FOOD FROM 1941 TO 1950*

MARGUERITE C. BURK

Bureau of Agricultural Economics

TOTAL and per capita demand for food in the United States has increased in the past decade. Practically all of the net increase from 1941 to 1949 and 1950 can be accounted for by the obvious increase in the population and the rise and change in distribution of real disposable income. Food expenditures, the quantities of food consumed, and food prices have changed so much during the decade that underlying patterns of the demand for food appear from casual examination of published data to have changed in relation to income. A contrary conclusion is reached after detailed analysis of the several statistical series relating to food expenditures, food consumption, and retail food prices which are currently published by the Departments of Agriculture, Commerce, and Labor, and special survey data, all of which require a number of adjustments to adapt them for demand analysis.

Analyses of the relevant data, after appropriate adjustments, indicate that food expenditures in 1949 were about 10 to 15 percent higher than would have been expected solely on the basis of prewar relationships between consumer incomes and food expenditures. Those relationships indicate that a one percent increase in disposable income was associated with increased food expenditures of about 0.8 percent. The higher level of post-war food expenditures is largely due to increased demand for services with food, extra purchasing power, and the change in the distribution of income.

Regression analyses of time series data on food prices and food consumption, as well as an income level analysis of the quantity of food consumed

* This brief study presents some of the preliminary findings of analyses of food consumption carried on under provisions of the Agricultural Research and Marketing Act of 1946. The author acknowledges the assistance of numerous economists of the Federal Government in the development of these analyses, and of Herman Southworth in their clarification, but assumes full responsibility for this tentative statement.

per capita, support the conclusion that food prices paid and quantities of food consumed (after postwar adjustments had been made) are well in line with prewar relationships to disposable income per capita. Retail food prices have almost unit elasticity (1.0) with disposable income when the supply of food is held constant. The analyses indicate a 0.2 increase in food consumption with one percent increase in disposable income, holding retail food prices constant, which is mathematically consistent with the elasticity of food expenditures of 0.8 mentioned earlier.¹

These conclusions suggest that much of the discussion of the inelasticity of demand for food based on physical needs and static family expenditure data has been misleading. The demand for food in terms of price and quantity through time is surprisingly responsive to income.

The analysis leading to these conclusions will proceed as follows:

(1) Two types of food expenditure data, from sample surveys and from time series, are studied to determine the prewar patterns (a) of food expenditures and consumer income level (static income-elasticity of food expenditures) and (b) of per capita food expenditures to average disposable income for the United States as a whole over time (dynamic income-elasticity of food expenditures). Then the postwar relationships will be considered to see how they compare with those expected on the basis of average income. The fact that they have exceeded estimated levels leads then to Part 2.

(2) Possible transitory and enduring factors in the higher level of food expenditures will be examined. Contributing to an enduring higher level are increased outlay for processing outside the home, in factories and public eating places, and increased urbanization of the population.

(3) The subsequent analysis of the quantity and price components of food expenditures is based on both special survey data and time series on per capita food consumption and retail food prices. Prewar interrelationships with income are derived and used to estimate postwar rates, which are then compared with actual data. The small differences for 1949 and 1950 support the conclusion that there has been no significant change in the underlying pattern of the demand for food in relation to income, which is much less inelastic than some earlier studies based on limited data would indicate.

An operating economist has some difficulty in identifying a change in demand despite the fact that economic literature is replete with learned discussions on the subject. There will be no attempt to add to that literature. Instead, we shall simply consider available data bearing on the demand for food to find out whether they indicate underlying changes in the demand for food. There is greater total demand for food now than 10 years

¹ The author is indebted to Herman Southworth for mathematical proof of this interrelation of elasticities.

ago, because of the increase in population. But what about average per capita demand? Has it been affected by changes in living habits such as rural-urban shifts, changes in hours worked, and in types of work, or by such factors as changes in the age and sex distribution of the population, changes in total real income and its distribution, or by changes in the relative expenditures for nonfood commodities or in savings, or by substantial changes in the demand for individual foods?

Everyday analysis of changes in demand for food is plagued by the fact that the economic theorist's qualification "other conditions remaining the same" rarely is substantiated. We have to operate in a world of simultaneous equations. In undertaking an analysis of the demand for food in the past decade, we recall immediately the admonitions of Working, Schultz, and Stigler concerning the nature of statistical demand curves. In reality, our problem is that of estimation of probable consumption and prices, not estimation of demand in the classical sense. Moreover, as part of the process of measuring changes in the demand for food, food expenditures will be studied as well as quantities and prices, with the realization that this introduces problems of amount of services with food per se and of possible varying qualities of individual commodities and combinations of commodities. Furthermore, certain other difficulties which beset our path must be recognized. Data representing food expenditures, published by the Departments of Commerce and Agriculture, are developed for other purposes than demand analysis, hence they require certain adjustments, to which reference will be made below. Even with proper adjustments, these really can represent only demand for food at retail, including demand for marketing services, not demand for farm food commodities at the farm gate. The latter is in effect a derived demand.

Before proceeding with the study of recent changes in consumer demand at retail, certain problems must be indicated which are involved in the three types of available data, food expenditures, food consumption, and retail food prices. None of these is ideally suited to the problem at hand. The food expenditure series published by the Department of Commerce includes some foods priced at wholesale and some at the farm level. The food expenditure information reported in consumer surveys usually understates food consumed away from home, the annual data are based on recall, and many approximations are necessary in the estimation of annual averages of consumption from reported data for one week only. The data on food consumption derived from information on supplies and distribution require adjustment for wastes and losses in distribution, and food eaten at home cannot yet be separated from that consumed in restaurants and other institutions. Quantities and prices of food purchases reported in special surveys involve certain biases, and the surveys have been infrequent. Data on retail food prices in urban and rural areas are gathered for specific purposes and on different bases.

Food Expenditures as a Measure of Demand for Food

As indicated above, two types of food expenditure data are available for the United States—those taken from sample surveys and aggregate time series data such as those of the Department of Commerce and the Department of Agriculture.

Table I contains the data on food and beverage expenditures for the

TABLE I. AVERAGE DISPOSABLE INCOME AND FOOD EXPENDITURE PER CAPITA, AND PROPORTION OF INCOME SPENT FOR FOOD BY INCOME GROUP, 1935-36 AND 1941^a

Total income per consumer unit ^b	Average disposable income per capita in current dollars	Food expenditures per capita	
		Average in current dollars	Percentage of disposable income
	Dollars	Dollars	Percent
1935-36			
Under \$500	113	69	61
\$ 500 to 999	242	104	43
1,000 to 1,499	370	132	36
1,500 to 1,999	502	154	31
2,000 to 2,999	679	179	26
3,000 to 4,999	982	209	21
5,000 and over	3,270	344	11
Average	462	134	29
1941			
Under \$500	122	91	75
\$ 500 to 999	293	130	44
1,000 to 1,499	446	167	37
1,500 to 1,999	529	179	34
2,000 to 2,999	734	206	28
3,000 to 4,999	1,008	247	24
5,000 and over	2,027	354	18
Average	680	191	28

^a Data derived by author from 1935-36 *Consumer Income and Expenditure Studies* of the National Resources Committee and 1941 *Study of Spending and Savings in Wartime*. Disposable income includes money and nonmoney incomes; 1941 incomes adjusted for under-reporting. Food expenditures include expenditures for alcoholic beverages and for food away from home, and home-produced food valued at local prices. All data exclude residents of institutions.

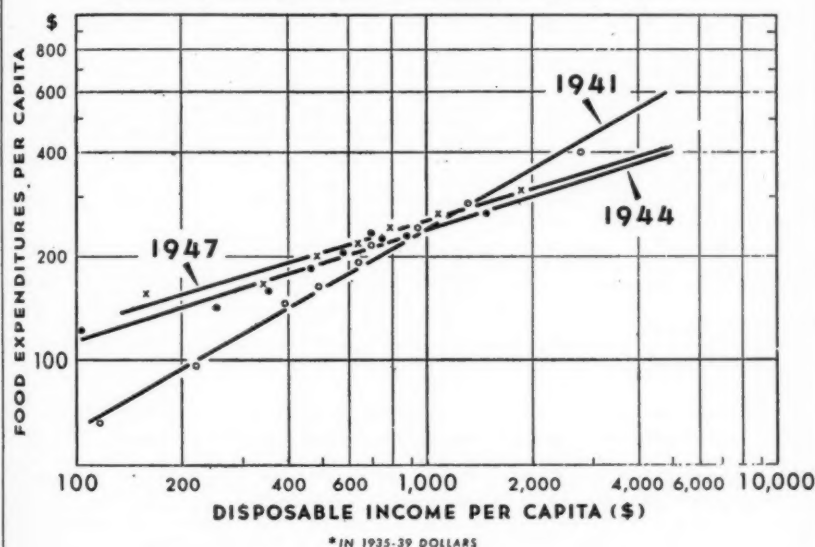
^b Approximates disposable income.

whole population derived by the author from the 1935-36 and 1941 surveys, as well as roughly comparable data on total consumer disposable income per person, the proportion thereof being used for such expenditures, and average food and beverage expenditures per person. There seems to have been remarkable stability in the relationships of all but the highest and lowest income groups. The income elasticities of the two sets of data are prac-

tically equal, .48 and .49. They represent "static income-elasticity."² If there is no change in the static income-elasticity of demand through time and none in the average rate of food expenditures of families in each real income group, we are probably justified in concluding that there has been no basic change in the demand for food, even though the national total may increase with a growing population or with a larger proportion of people in the higher real income groups. If there were an equi-proportional rise in

AVERAGE FOOD EXPENDITURES AND DISPOSABLE INCOME PER CAPITA OF URBAN FAMILIES*

By Income Group, From Surveys for 1941, 1944, 1947



U. S. DEPARTMENT OF AGRICULTURE

NEG. 48135-X BUREAU OF AGRICULTURAL ECONOMICS

FIG. 1

food expenditures of all income groups, a higher "dynamic income-elasticity of demand" would result. By "dynamic income-elasticity of demand" we mean the relationship through time of changes in the national average of food expenditures to changes in national average income.

² The formulae of regression lines fitted to the logarithms of average expenditures per person for food and alcoholic beverages, money and nonmoney, against logarithms of average total disposable income per person in current dollars, are for 1935-36, $Y' = .88 + .48X$, and for 1941, $Y' = .93 + .49X$. R^2 of both equations equals .99. The coefficients of X in these equations are a measure of the income-elasticity of demand for food at a particular period of time, i.e., "static income-elasticity."

TABLE II. ROUGH APPROXIMATIONS OF DISTRIBUTION OF INDIVIDUALS BY CONSUMER-UNIT DISPOSABLE INCOMES IN SELECTED YEARS: 1941 SURVEY PATTERN OF PER CAPITA INCOMES AND FOOD EXPENDITURES ADJUSTED TO CONSUMERS' PRICE INDEX OF 133; WEIGHTED AVERAGES OF DISPOSABLE INCOMES AND FOOD EXPENDITURES IN SELECTED YEARS, AND RATIOS BETWEEN THEM

Total disposable income per consumer unit ^a	Approximate proportion of individuals ^b					Estimated average per capita, 1941 survey pattern adjusted to CPI of 133 ^a		
	1935-36	1941	1943	1946	1948	Disposable income	Food expenditures	Percentage of income
	Percent	Percent	Percent	Percent	Percent	Dollars	Dollars	Percent
Under \$500	11	3	3	3	3	122	100	82
\$500 to 999	17	10	7	6	6	293	150	51
1,000 to 1,499	20	10	10	8	9	446	189	42
1,500 to 1,999	16	13	14	11	10	529	194	37
2,000 to 2,999	19	24	23	22	27	734	241	33
3,000 to 4,999	12	27	27	32	28	1,008	284	28
5,000 and over	5	13	16	18	17	2,027	406	20

Item	Weighted average at consumers' price index of 133				
	1935-36	1941	1943	1946	1948
	Dollars	Dollars	Dollars	Dollars	Dollars
Average real disposable income per capita ^d	599	858	908	964	939
Average expenditure for food and alcoholic beverages	206	249	257	265	262
	Percent	Percent	Percent	Percent	Percent
Percentage of income					
Total	34	29	28	27	28
Alcoholic beverages ^e	3	4	4	5	4
Food	31	25	24	22	24

^a Money and nonmoney income; dollar values set 33 percent above 1935-39 average.

^b Estimated by author with assistance of Nathan Kofsky, Selma Goldsmith, and Richard Butler, using data from *Study of Consumer Incomes* for 1935-36, *Study of Family Spending and Saving* data and Office of Price Administration estimates for 1941 and 1943, and data of the Census Bureau and the Council of Economic Advisers for 1946 and 1948. All distributions in terms of dollars at consumers' price index of 133 percent of 1935-39 average.

^c The 1941 survey pattern of average incomes and food expenditures given in Table I was adjusted from the price level 5 percent above the 1935-39 average, to a price level 33 percent above that average, in order to be on same dollar-value basis as the income distributions and to match data previously developed on per capita food consumption by income level.

^d Derived from adjusted 1941 survey pattern. Averages for 1943 and 1946 appear to be 5 to 10 percent low, in comparison with averages derived from aggregate national income data, because of somewhat higher average incomes within income groups, particularly the much higher average for the group with incomes over \$5,000. This understatement of income naturally would be accompanied by some understatement of food expenditures; therefore, the derived proportion of income spent for food is regarded as a reasonable estimate, under the conditions imposed.

^e Estimated from 1941 survey data.

Unfortunately, there has not been a nation-wide survey of food purchases of rural families since 1942, so we cannot be sure whether the static income-

elasticity of demand for food in the United States has changed in the past decade or not. But there are two indications that it probably has changed. First, data on the income-food expenditure relationships of urban families in 1941, 1944, and 1947 appear to indicate at least a temporary change in the pattern of food expenditures by the several income groups, i.e., in the static income-elasticity of demand for food.³ (See Figure 1.) The factors contributing to this change will be examined in a later section.

Second, even after temporary postwar forces have run their course, and adjustments to a relatively "normal" pattern of expenditures have been made, actual food expenditures in 1948-50 appear to have been significantly higher in relation to income than the projection of prewar income-expenditure relationships would indicate. These relationships were projected by deriving weighted averages of income and of food expenditures (see Table II), using some rough approximations of distributions of individuals by total disposable real income per consumer unit. Estimates of expenditures for alcoholic beverages must be subtracted to arrive at food expenditures, per se. These estimated food expenditures were compared with income for the postwar years 1947 and 1948, giving 22 and 24 percent, respectively. Since average income and other information on income indicate that the income situation in 1949 was fairly similar to that of 1948, the same 24 percent estimate can be used for the later year.

Because this procedure covers the change in food expenditures from 1941 to 1948 and 1949 due to both the increase in average income and shifts in the distribution of consumer units among the real income groups, the two were separated by the method indicated below.⁴ If there had been no change in relative distribution of individuals among income groups from that of 1941, as opposed to the distribution used for Table II, 23.5 percent of disposable income would have been spent for food instead of the 24 percent which was derived for 1948 and used for 1949. Time series data, the adjustment of which will be described below, indicate a significantly higher ratio of actual food expenditures to income in those years than either the 23.5 or 24 percent. Therefore, we may surmise that there has been at least a temporary increase in the dynamic income-elasticity of demand for food, due either to an equi-proportional rise in food expenditures or to a change in the static income-elasticity of demand.

³ The regression equations of the logarithms of food expenditures per capita (Y) against disposable income per capita (X), for urban families, by income group, for 1941, 1944, and 1947 are: 1941, $Y' = .64 + .58X$, $R^2 = .99$; 1944, $Y' = 1.47 + .33X$, $R^2 = .95$;

1947, $Y' = 1.61 + .31X$, $R^2 = .96$.

⁴ The Lorenz type curve of individuals distributed by consumer unit real income in 1941 was moved to the right by 13 percent, representing the increase in average real disposable income from 1941 to 1949, and the income distribution which would represent equi-proportional increases from the 1941 level to the 1949 level of income was read off. Using this distribution, new weighted averages of food expenditures and matching income were calculated, from which was obtained 23.5 percent as the proportion of income spent for food (after subtracting out alcoholic beverage expenditures).

TABLE III. FOUR SERIES OF ESTIMATES REPRESENTING FOOD EXPENDITURES PER CAPITA AND COMPARISONS WITH DISPOSABLE INCOME, 1929-50

Year	Derived estimates of retail value of food				Adjusted Commerce Dept. estimates of food expenditures ^d		Adjusted cost of farm food products ^e	
	1935-39 dollars		Current dollars		Per person in current dollars	As a percentage of disposable income	Per person in current dollars	As a percentage of disposable income
	Average per civilian ^a	As a percentage of real disposable income ^b	Average per civilian ^c	As a percentage of disposable income				
	Dollars	Percent	Dollars	Percent	Dollars	Percent	Dollars	Percent
1929	145	26.5	193	28.6	179	26.6	203	30.2
1930	144	28.9	181	30.4	164	27.6	189	31.8
1931	143	30.7	148	29.4	136	26.9	154	30.5
1932	139	35.5	120	31.5	107	28.0	126	33.0
1933	137	35.5	115	32.2	102	28.5	125	34.9
1934	138	32.7	130	32.0	112	27.6	138	34.1
1935	135	29.3	136	30.0	123	27.1	147	32.4
1936	141	27.1	142	27.8	134	26.1	157	30.5
1937	142	26.6	150	27.3	142	25.9	157	28.7
1938	143	26.8	140	27.9	135	26.9	148	29.5
1939	148	27.6	141	26.4	134	25.2	147	27.5
1940	151	26.6	146	25.6	141	24.8	150	26.2
1941	157	24.0	165	24.1	163	23.8	169	24.6
1942	158	21.4	196	22.7	201	23.3	200	23.2
1943	161	20.6	222	23.0	232	24.0	231	24.0
1944	166	19.7	226	21.3	247	23.3	234	22.1
1945	172	20.5	239	22.2	268	24.9	249	23.1
1946	177	22.1	283	25.3	310	27.7	292	26.1
1947	171	23.2	331	28.3	349	29.9	333	28.5
1948	165	22.2	348	27.2	371	29.0	344	26.9
1949	164	22.2	331	26.5	356	28.5	321	25.7
1950	165	21.2	336	25.3	362 ^f	27.2	321 ^f	24.3

^a Value aggregates of civilian per capita food consumption index plus estimated extra cost of food in public eating places, in constant 1935-39 dollars.

^b Department of Commerce series deflated by consumers' price index.

^c Value in 1935-39 dollars multiplied by BLS retail food price index.

^d Includes rough adjustments to exclude military food and value all food except that in public eating places at retail.

^e Adjusted as described in text.

^f Rough estimate.

We now proceed to time series data on food expenditures and begin the analysis of dynamic income-elasticity of demand with a series constructed to match most of the basic concepts of the family budget data. The value aggregates of the civilian per capita food consumption index (quantities of major foods consumed per person multiplied by average retail prices in 1935-39) have been combined with estimates of the extra cost for services of public eating places, on a per capita basis, estimated from Department of Commerce food expenditure data and deflated by the consumers' price index in order to approximate constant dollar expenditures. These estimates of the retail cost of food, including restaurant services, representing in large part a static situation, are given in Table III.

Since our interest is in the dynamics of the demand for food, price changes were introduced into the above index by multiplying the per capita retail cost or value series by the urban retail food price index (1935-39 = 100). This derived series still contains certain deficiencies which stem from the basic concept of the per capita food consumption index. Although the index, as now constructed, measures essentially quantitative changes in food consumption, it allows for some shifts in consumer purchases within food groups, for example, fresh to processed fruits, vegetables, fish, and dairy products. But it excludes such shifts within the meat, sugar, and flour categories as well as the consumption of offals (which is assumed to vary directly with the consumption of carcass meat, but contributes a \$3 increase). The inclusion of these factors adds about \$5 to the average retail value of food consumed in 1939 and \$15 in 1947 (in current dollars).

Before proceeding with the analysis, we shall make certain adjustments in two existing time series which are indicative of changes in the demand for food. The first of these is the Department of Commerce series on food expenditures, which is compiled as part of the process of estimating national income. This series has been adjusted to exclude alcoholic beverages, to exclude food furnished the Armed Forces, to value all civilian food at retail prices, and then to put it on a per capita basis (Table III). The other series, the retail cost of farm food products as estimated by the Department of Agriculture in connection with its work on farm-retail price spreads, was adjusted to include the retail value of farm produced, farm home-consumed foods; the nonfood costs of public eating places; the retail value of imported foods and of fish and fishery products (also in Table III).

Comparison of the three series, in current dollars, indicates that the general patterns are quite similar although the levels are somewhat different. The series derived from the per capita consumption value aggregates is generally lower than the adjusted series based on retail cost of farm food products. On the other hand, the series derived from the Department of Commerce food expenditure data are significantly lower in prewar years, and higher since 1943, than the other two series.

These time series on food expenditures can be used in two ways to measure the possible extent of change in the demand for food in the postwar period as compared with the prewar.⁵ The regression equations of the logarithms of the four different measures of food expenditures against the logarithms of disposable income for the years 1929-41 were calculated by least squares and were used to estimate food expenditures in 1946-50.⁶ Also, the percentage of income spent for food in 1929-41, as measured by the three series in current dollars, was used in logarithms in regression equations with

⁵ For further discussion, see "A Study of Recent Relationships Between Income and Food Expenditures," by this author, in *Agricultural Economics Research*, July 1951.

⁶ The regression equations for the logarithms of the four food expenditures series (Y) and the logarithms of disposable income per capita (X), fitted 1929-41, are:

the logarithms of real disposable income.⁷ Then the percentages which would have been expected in 1946-50 were estimated on the basis of prewar relationships, realizing of course the problems of such extrapolation. Using these regression equations, the estimates of food expenditures per capita in 1946-50 and the derived estimates of percentages of income spent for foods were obtained and are also given in Table IV. The use of *real* disposable income in the latter set of regressions gives slightly higher percentages of

TABLE IV. FOUR SERIES OF ESTIMATES OF FOOD EXPENDITURES PER CAPITA AND ESTIMATES OF PROPORTION OF INCOME SPENT FOR FOOD, 1946-50

Year	Derived series, retail value of food in 1935-39 dollars	Derived series, retail value of food in current dollars		Adjusted Commerce Dept. food expenditure series		Adjusted series on retail cost of farm food, plus nonfarm	
	Value ^a	Value ^a	Proportion of income ^b	Value ^a	Proportion of income ^b	Value ^a	Proportion of income ^b
	Dollars	Dollars	Percent	Dollars	Percent	Dollars	Percent
1946	160	246	21.9	257	22.8	248	22.3
1947	157	254	23.0	266	23.4	255	23.5
1948	158	269	22.8	286	23.3	269	23.3
1949	157	265	22.9	281	23.4	265	23.5
1950	159	276	22.4	296	23.0	276	22.8

^a Estimated from regression equations of footnote 6.

^b Estimated from regression equations of footnote 7.

current income than those derived by direct comparisons of estimated expenditures and current income. Because of the importance of *real* income as opposed to *dollar* income in the pattern of family expenditures, the latter approach to the estimation of food expenditures appears to have greater merit.

(a) Series derived from per capita consumption data, both series in constant dollars

$$Y' = 1.53 + .23X; R^2 = .73$$

(b) Series derived from per capita consumption and retail food price indexes (current dollars)

$$Y' = .35 + .67X; R^2 = .84$$

(c) Adjusted Department of Commerce food expenditures series (current dollars)

$$Y' = -.07 + .81X; R^2 = .96$$

(d) Series based on retail cost of farm food products (current dollars)

$$Y' = .53 + .61X; R^2 = .78$$

The coefficients of X in the last three equations are in effect a measure of the "dynamic income-elasticity of demand for food," taking into account both quantities of food and prices for food.

⁷ The regression equations calculated from the logarithms of the income-food expenditure ratios (Y) and the index of real disposable income per capita (X), (1935-39 = 100), fitted 1929-41, are:

(a) Series derived from per capita consumption and retail food price indexes

$$Y' = 2.54 - .55X; R^2 = .86$$

(b) Adjusted Department of Commerce food expenditure series

$$Y' = 2.04 - .31X; R^2 = .83$$

(c) Series based on retail cost of farm food products

$$Y' = 2.71 - .62X; R^2 = .83$$

To summarize the above calculations: (1) on the basis of changes in average income and in the distribution of income, but with no change in static income-elasticity of demand, we would have expected food expenditures to take 24 percent of income in 1948, and about the same proportion in the following two years. (2) Use of postwar average incomes per capita with the patterns of relationships of food expenditures to disposable income in prewar years 1929-41 (given in footnote 7) indicates that food expenditures in 1947 were roughly 25 percent higher than expected (comparing percentages in Tables III and IV); in 1948, 20 percent; in 1949, 15 percent; but in 1950, only about 10 percent. The gradual reduction in the gap between actual and estimated food expenditures leads to the hypothesis that the relatively high levels of food expenditures in 1946-48 may have been temporary.

Factors Contributing to the Increase in Food Expenditures

The increase in food expenditures since 1941 has been greater than would be expected on the basis of increased real disposable income, and indicates a greater demand for food in terms of dollars spent. Does this represent a permanent rise in demand, or just a postwar phenomenon of short duration, or a combination of the two? Does the increase in demand come from equal increases at all income levels, or has the static income-elasticity of demand for food changed?

At this point, we recall that the static pattern of income-food expenditure relationships did change for urban families between 1941 and 1947, as shown by Figure 1. This change indicates the existence and the importance of factors other than shifts in the distribution of income and the higher average postwar income. These factors may be short-run or long-run in duration.

Two obviously short-run factors were (1) the natural lag in adjustment of food consumption patterns to rapid postwar changes in income and to the relative supplies and prices of food and nonfood commodities and (2) the availability of unusual sources of purchasing power over and above current income. A possible explanation of the precipitous rise in food prices after decontrol in 1946, as well as their high levels in 1947 and early 1948, lies in the fact that consumers were willing to spend increasingly more money if necessary in order to continue buying the quantity, quality, and kinds of foods they had become accustomed to buying in the preceding years of high incomes and controlled prices. After mid-1948 the proportion of disposable income spent for food declined significantly.

Contributing to the lag in adjustment of food expenditures was the availability to many families of unusually large liquid assets and the relaxation of controls on consumer credit. The continued shortage of some high-cost durable goods was another contributing factor. From the standpoint of national income, use of liquid assets and consumer credit is in the first instance a net addition to the purchasing power available from current

income. For a year such as 1947 average disposable income understates the purchasing power of consumers and makes food expenditures appear to be disproportionately high. Furthermore, such extraordinary purchasing power was particularly significant in maintaining food expenditures of low- and moderate-income families at a high level in 1947-49, and reduced the static income-elasticity of demand, as indicated by Figure 1. Data from the 1950 Survey of Consumer Finances indicate that among those spending units reducing liquid assets in 1949, 49 percent of the units with incomes under \$2,000 reported using at least part of their liquid assets for food, clothing, and non-durable goods, compared with 31 percent for the \$2,000 to \$4,999 income group and 17 percent of those units with incomes over \$5,000.⁸

From the Federal Reserve Board's Surveys of Consumer Finances were derived the estimates that the reduction in liquid assets amounted to about \$39 per person in 1947 and \$16 in both 1948 and 1949. Adding to these estimates the increase in consumer indebtedness per capita, we obtain \$61 of extra purchasing power for 1947 and \$32 for 1948 and 1949, which brings total purchasing power up to \$1,231 for 1947, \$1,310 for 1948, and \$1,281 for 1949. Use of these data in the regression equations of footnote 7 gives estimated food expenditures shown in Table V.

TABLE V. ESTIMATES OF FOOD EXPENDITURES BASED ON TOTAL PURCHASING POWER AND ACTUAL FOOD EXPENDITURES

Year	Derived series, current dollars		Adjusted Commerce expenditures		Adjusted BAE retail cost of food products	
	<i>Estimated</i>	<i>Actual</i>	<i>Estimated</i>	<i>Actual</i>	<i>Estimated</i>	<i>Actual</i>
1947	\$263	\$331	\$277	\$349	\$263	\$333
1948	\$274	\$348	\$292	\$371	\$273	\$344
1949	\$270	\$331	\$287	\$356	\$269	\$321

Department of Commerce expenditure and savings data indicate the unusual character of the income-expenditure-savings relationships in the immediate postwar years.⁹ The decline in the proportion of income going to food in 1948, 1949, and 1950 was not offset by increases in expenditures for other items, but was offset in part by a return to the prewar relationship of savings to high level disposable income. This supports the hypothesis that extraordinarily high food expenditures in 1947 and early 1948 were due in large part to a temporary lag in the adjustment of consumer expenditure and savings patterns to a changing situation.

We shall now consider possible factors contributing to the postwar rates of food expenditures which are likely to be more permanent in dura-

⁸ Table 14, Part V, reprinted from *Federal Reserve Bulletin* for December 1950.

⁹ Excellent discussions of these relationships may be found in two articles in the *Survey of Current Business*: Irwin Friend, "Personal Saving in the Postwar Period," September 1949; L. Jay Atkinson, "The Demand for Consumers' Durable Goods," June 1950.

tion, and most of which appear to indicate some changes in manner of living. Among such factors are movement of population from rural to urban areas, increased "eating out," shifts in channels of distribution, increased consumption of processed foods, greater use of fresh vegetables in "off-seasons," and changes in the age distribution of the population.

A movement of population from rural to urban areas such as that which took place between 1941 and 1949 is bound to affect food expenditures and incomes, but the extent is difficult to measure. Obviously, farm families spend less money for food than nonfarm families because they grow some of their own, and food they buy costs about 10 percent less than urban prices.¹⁰ This shift from rural to urban areas is not reflected fully in the three adjusted series on food expenditures. The series which was derived from the per capita food consumption aggregates values all foods at prices paid by moderate-income families in urban areas; and the other two series, as adjusted to the concepts of the survey data, value the food for home consumption on farms where produced at a composite rural-urban price.¹¹ At the most, the difference in prices paid arising from the rural-urban shift might account for a \$7 increase in national per capita food expenditures. The effect of changes in income arising from the rural-urban shift has already been taken into account.

One factor in higher postwar food expenditures, increased eating in restaurants and other institutions, appears to be a significant change in eating habits. The costs of "eating out" include the payment for additional processing, service, atmosphere, and sometimes entertainment. If a greater proportion of total food consumed is purchased in public eating places, expenditures for food can be higher even without a change in total quantities of food consumed. The increased cost due to this factor amounted to about \$8 per person from 1941 to 1949.

Another type of shift in the channels of food distribution which would be expected to affect the level of food expenditures is the shift from lower cost to higher cost distributors in urban areas, such as that from large chain stores to small corner grocers or delicatessens. Although this factor was probably important during the war, the 1941 pattern of distribution was apparently restored by 1949. For example, chain and mail order food sales accounted for 30 percent of total retail sales in 1941, 25 percent in 1944, 30 percent in 1948, and 32 percent in 1949.

Item by item analysis of changes in per capita consumption of fresh and processed foods from 1941 to 1949 indicates that the total increase in food expenditures from 1941 to 1949 due to shifts to foods processed out-

¹⁰ See p. 161 of the article by Nathan Kofsky, "Farm and Urban Purchasing Power," Volume 11, *Studies on Income and Wealth*.

¹¹ Combining the prices paid by farmers, BAE index, for rural segment of the population and the BLS retail food prices for the urban population.

side the home (except in public eating places) might amount to \$12 per person. At this point, however, we recall that some of the shift from fresh to processed foods would be expected to result from increased incomes, and to a lesser degree from processed to fresh, as in the case of vegetables. From analysis of income-expenditure patterns it appears that about three fifths of this rise in food expenditures for processed foods is due to higher incomes and two fifths to the trend toward increased processing outside the home, a continuing change in food marketing.

In order to determine the possible effect on food expenditures of somewhat greater consumption of foods in "off-seasons," i.e., "off-season" from local production, available data on changes in seasonal production of several foods were studied. The only item showing a significant change was truck crops for fresh market. Even here, the increase in winter season output from 1941 to 1949 amounted to less than 10 pounds per capita and the increased cost totaled only about 15 cents.

The substantial increase in the birth rate in the past 11 years leads one to consider the effect of a larger proportion of children on food expenditures. The increased consumption of prepared baby foods and of dairy products has already been accounted for. For other commodities one might well argue that this change in age makeup might contribute to lower rather than higher food expenditures.

All three of the series on food expenditures in terms of current dollars indicate that such expenditures per person increased more between 1941 and 1949 than did disposable income. On the basis of the prewar dynamic pattern of income-food expenditure relationships, taking the level of real income into account, as in footnote 7, we would expect food expenditures to have averaged about 23.5 percent of disposable income in 1949 or \$295 per person. We have accounted for most of the difference between this and the actual expenditure of approximately \$335 (the average of the three series) as follows: (1) change in distribution of income, \$7; (2) extra purchasing power from use of liquid assets and consumer credit, \$8; (3) expenditure for additional processing outside the home and public eating places, \$5; (4) rural-urban shift in prices paid for food, \$7; (5) increased costs of eating away from home, \$8. These adjustments account for \$35 of the \$40 difference between estimated and actual expenditures.

A rather clear way of indicating the net change in the level of food expenditures in postwar years is to add 1949 and 1950 to regression (c) of footnote 6, i.e., adjusted Department of Commerce statistics of food expenditures against disposable income. This raises the dynamic income elasticity of food expenditures from 0.8 to 1.0.¹² The fact that this change arose principally from increased marketing services can be demonstrated in a

¹² Log of food expenditures per capita (Y) = $-.55 + .99(X)$ (log of disposable income per capita); $R^2 = .98$.

similar manner by comparing the elasticity of price times quantity with a change in disposable income from a regression for the years 1922-41 with another using the same factors but adding 1949 and 1950.¹³ The coefficients or elasticities are virtually equal—0.8.

The magnitude of the elasticity of the latter measure of food expenditures with respect to disposable income has an important bearing on the demand for farm food products. Because of the relative constancy of marketing margins for farm products, it appears likely that the elasticity of cash receipts by farmers for food products to a one percent change in average disposable income is higher than 0.8 percent. This indicates a much greater degree of income elasticity of demand for farm food products than the .25 estimated by T. W. Schultz in 1945.¹⁴ In fact, the elasticity of .25 is remarkably close to the income elasticity of the quantity of food purchased as measured by the quantity index of per capita food consumption, holding price relationships constant. But it is the combined elasticities of quantity and price (0.8) which have most economic significance—for farmers are interested in total receipts, not just in quantities demanded.

Analysis of the Quantity and Price Components of Food Expenditures

The measure of food expenditures constructed by multiplying the aggregates of the per capita consumption index by the retail food price index is useful in examining the changes in the major components of any series on food expenditures—quantity times price. Estimates of the product (PQ) for 1949 and 1950 made on the basis of the equation fitted for 1922-41 are \$288 and \$302 respectively, compared with the "actual" of \$300 and \$307. Accordingly, estimates of the rates of per capita food consumption and the average index of retail food prices for 1949 and 1950, based on prewar relationships, would be expected to come close to actual food consumption and food prices. This conclusion is borne out by several analyses which have been made.

Probable consumption of food, the quantity axis of the three surfaces—quantity, price, and income, can be estimated by the two methods used above for food expenditures, by the income level approach and by time series regressions. Indexes of per capita consumption by the several real income groups¹⁵ were multiplied by the proportions of the population in those

¹³ Here food expenditures (Y) were the product of the weighted value aggregates of the food consumption index times the BLS retail food price index in logarithms, current disposable income in logarithms (X).

(a) Fitted 1922-41, $Y' = .57 + .79X$; $R^2 = .81$

(b) Fitted 1922-41, 1949 and 1950, $Y' = .53 + .81X$; $R^2 = .93$

¹⁴ *Agriculture in an Unstable Economy*, McGraw-Hill, New York, p. 68.

¹⁵ See pp. 134-142, U. S. Department of Agriculture, Misc. Pub. No. 691, *Consumption of Food in the United States, 1909-48*. The regression equation of the logarithms of these indexes against average per capita income within each consumer unit income group in 1941 is $Y' = 1.34 + .24X$; $R^2 = .98$.

income groups given for several years in Table II with the results indicated in Table VI. This method assumes (1) no change in the static income-elasticity of quantities of food and (2) ratios of food to nonfood prices and price relationships among individual foods about equal to those of 1941.

Three observations are pertinent: (1) the level of the adjusted per capita consumption rates by income group may be set about two or three percent too high; (2) this method of estimating does not allow for long-time trends in consumption of individual foods due to factors other than real income; (3) problems of food supplies, particularly of livestock products, probably contributed significantly to the reduction of actual consumption below estimated "demand," especially in 1948. At the end of the war, wide-

TABLE VI. INDEX OF CIVILIAN PER CAPITA FOOD CONSUMPTION AND ESTIMATES OF DEMAND FOR FOOD, IN SELECTED YEARS (1935-36=100)

Year	Actual index of per capita consumption	Estimated demand using		
		Indexes of per capita consumption by income group	Time series regression	
			Disposable income only	Including extra purchasing power
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
1935-36	99	103	100	—
1941	109	114	108	—
1946	119	117	110	—
1947	115	—	107	109
1948	111	116	107(-)	107(+)
1949	111(-)	—	107	108
1950	112(-)	—	109	—

spread fear of postwar deflation, economic depression, and food surpluses led to lowering of production rates for some foods, particularly livestock products, in subsequent years. Thus, decisions of certain groups of food producers made in 1945 and 1946 appear to have so limited the level of food output in the next couple of years that it could not be raised to meet stronger demand than was expected. Thus, producers' anticipations as to long-run demand became in effect a factor affecting supply in a shorter period. A detailed analysis was made of the supply situation for each major commodity for the years 1945 to 1949. Wherever it appeared that a shortage of supply in 1948 had restricted consumption in that year, the 1946 rate of per capita consumption was used for that item in deriving an estimate of what the over-all index of civilian per capita consumption might have been in 1948 without supply limitations. From this analysis it appeared that three index points of the decline in per capita food consumption between 1946 and 1948 were due to short supplies, not reduced demand.

The time series approach, using prewar relationships of the index of per capita food consumption, disposable income, and the index of retail food prices to all consumer prices, yields the two sets of estimates also given in

Table VI.¹⁶ This approach obviously allows for changing price relationships and changing average income, but not for changes in the distribution of income, which would raise the index for 1949 by about one point. In effect, use of changing price relationships introduces the problem of available supply into the analysis of the quantity axis of the three axis demand surface.

Time series data were also used to ascertain prewar relationships with retail food prices as the dependent factor, and disposable income and the index of food consumption per capita, to represent food supplies, as the independent factors.¹⁷ This regression fitted for the years 1922-41 gives a 1.04 percent change in retail food prices to a 1.0 percent change in disposable income. At first glance this elasticity contradicts the 0.8 elasticity for the product of price times quantity in response to a change in disposable income. The problem is resolved by recalling the fact that the 1.04 assumes a constant food supply, whereas the 0.8 allows the offsetting effect of increased supply. The average response of the quantity of food consumed to disposable income in 1922-41 was found to be 0.24, holding food prices constant.

Use of the regression given in footnote 17, fitted for 1922-41 by least squares, yields the following estimates for the retail food price index in 1946-50, 1935-39 = 100:

<i>Year</i>	<i>Estimated index</i>	<i>Actual index</i>
1946	133	160
1947	154	194
1948	191	210
1949	190	202
1950	196	204

The differences between the actual and the estimated indexes of retail food prices decreased abruptly after 1947, indicating the adjustment of food buying patterns to the changed income situation and also the reduction in food supplies discussed above. In fact, the differences between actual and estimated retail food prices in 1948-50 are significantly less than was the case for food expenditures estimated from the Department of Commerce data, which are derived from retail sales information.

Certain factors affect food expenditures without affecting the BLS urban retail food price index directly. These include demand for increased process-

¹⁶ Log $Y' = 1.94 + .24 \log X_1 - .20 \log X_2$; $R^2_{1,2} = .84$

Y = index of per capita food consumption (1935-39 = 100)

X_1 = index of disposable income per capita in current dollars, 1935-39 = 100

X_2 = index of retail food prices

¹⁷ Log $Y' = 6.94 + 1.04 \log X_1 - 3.49 \log X_2$

Y = index of retail food prices, BLS

X_1 = index of disposable income per capita

X_2 = index of food consumption per capita

$R^2_{1,2} = .91$

ing away from home, the extra costs of eating out, and the rural-urban shift. Another factor is only partly accounted for by the BLS index of retail food prices. It is the greater preference for higher quality lines of the same foods which occurs with increased incomes. For example, with higher incomes, people usually want more choice beef roasts and steaks and less stew meat. Beef carcasses will yield only so many roasts and steaks unless inferior cuts are sold as substitutes, but more cattle can be grain fed to produce higher quality meat. Greater pressure on the available supply of roasts and steaks will increase their prices and be reflected in the price index and in food expenditures, but not in the quantity of beef consumed. But the greater consumption of higher quality and higher priced grades will not be reflected in the food price index. Stronger demand for fresh fluid milk can be met by reducing the amount going into evaporated milk, for example. This type of increase in demand will not affect the price index for which fixed quantity weights are used, but will be reflected in the food consumption index and in food expenditures. Increased demand evidenced by stronger preference for higher quality canned vegetables, for example, or aged cheese instead of young cheese, would not affect either the food consumption index or the retail food price index, but would increase food expenditures. Unfortunately, neither the information on prices paid by families for individual foods of specified type nor the time series data give us an adequate basis for estimating the importance of the quality factor in postwar food expenditures, prices, and per capita consumption.

From this discussion we may conclude that the combination of the rates of food consumption and levels of retail food prices in 1949 and 1950 were quite close to what would be expected from prewar relationships to income, if the extra purchasing power is taken into account for 1949. The greater variation between expected and actual per capita food consumption and retail food prices in 1947 and 1948 apparently arose from the lag in adjustment of food expenditures to the rapidly changing price and income situation, and to the nonavailability of much wanted durable goods, as noted above. Accordingly, it appears that the dynamic income-elasticity of demand for food commodities has remained substantially unchanged. In other words, the quantity of food demanded per person and retail food prices combined have followed in the later two years approximately the same pattern of relationship to available purchasing power as in prewar years. From this conclusion, it follows that factors other than income which might have affected the per capital demand for food over the same 10 years have either offset each other or have had relatively little effect.

THE MINIMUM-COST DAIRY FEED (An Application of "Linear Programming")

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THE main purpose of this paper is to test a method of determining the least expensive combination of feeds which meets, or surpasses, each of several stated requirements. The "linear programming" techniques recently developed by Koopmans,¹ Dantzig,² and others, are used to provide a definitive solution of this problem.

I want to make clear at the start that I do not pretend to be an expert on animal feeding. It is quite possible that the rations indicated by this analysis may be found unacceptable by practical feeders. If so, it is because the requirements used to illustrate this method do not adequately cover feed essentials. I would welcome any suggestions for improving the stated requirements. But the method of analysis used here is, in my opinion, exact. If the prices and nutritive values of all available feeds are known, that method will unfailingly indicate the least expensive combination of feeds meeting whatever requirements may be determined to be acceptable.

The Problem

Dairy cows require a certain minimum combination of nutrients for maintenance and for milk production. Part of these requirements ordinarily are met by pasture and hay. The rest must be supplied by concentrated feeds, including such whole grains as corn and oats, and such mill feeds as bran and cottonseed meal. Dairy men usually produce on their own farms the pasture and hay needed. They usually buy part, or all, of their requirements of concentrated feeds. The cost of purchased feed may represent as much as 35 percent of the total cost of producing milk in an area like New York and New England.

The dairyman naturally searches for any possible way to reduce this feed bill without lowering milk production. The feed manufacturer likewise searches for the lowest-cost feed which he can guarantee will meet nutritive standards. A reduction of even a few cents in the cost of each bag of feed manufactured may well change a loss to a profit.

* Malcolm Clough, of the Bureau of Agricultural Economics, supplied all data used in this study, and also made many practical suggestions concerning analysis and interpretation. Richard J. Foote, of BAE, read an earlier draft of the paper and made several suggestions. Karl Fox, also of the Bureau of Agricultural Economics, supplied a number of excellent footnotes and several other suggestions for clarifying the technical presentation.

The author, however, takes personal responsibility for both the analysis and the conclusions.
¹ T. C. Koopmans, "A Mathematical Model of Production," *Econometrica*, Vol. 17, Jan. 1949, p. 74.

² G. B. Dantzig, "Maximization of a Linear Form Whose Variables are Subject to a System of Linear Inequalities," ditto, USAF Comptroller, Nov. 1949.

The economic problem confronting the dairyman, or the feed manufacturer, is essentially one of "linear programming," to use a technical phrase. The amounts of nutrients in the feed mixture are linear functions of the quantities of corn, oats, bran, and other feeds. The dairyman, or the feed manufacturer, wants to adjust his purchases of each feed material in such a way that the mixture will provide at least a minimum amount of each important nutrient. In general, he cannot purchase a negative amount of any feed. He attempts to work out an economic "program," in other words, to determine how much of each feed to buy in order to supply all needed nutrients at the least possible cost. Technically, he is trying to minimize a linear function subject to several linear inequalities. Probably he does not realize this, just as Jourdain did not realize that he had written prose.

The dairyman or feed manufacturer who tries to find this sort of minimum is attempting a difficult piece of mathematical analysis. Perhaps this paper may help him.

The Data

The data in Table I were supplied by Malcolm Clough, of the Bureau of Agricultural Economics.

TABLE I. A. WHOLESALE PRICES AND NUTRITIVE CONTENT OF FEEDS

Feed	Grade or Type	Wholesale price, Kansas City, 1949-50 ^a	Nutritive Content of Feeds ^b			
			Total digestible nutrients	Digestible protein	Calcium	Phosphorus
Corn	#3 yellow	2.40	78.6	6.5	0.02	0.27
Oats	#3 white	2.52	70.1	9.4	0.09	0.34
Milo maize	#2	2.18	80.1	8.8	0.03	0.30
Bran	standard	2.14	67.2	13.7	0.14	1.29
Flour middlings	standard	2.44	78.9	16.1	0.09	0.71
Linseed meal	36%	3.82	77.0	30.4	0.41	0.86
Cottonseed meal	41%	3.55	70.6	32.8	0.20	1.22
Soybean meal	41%	3.70	78.5	37.1	0.26	0.59
Gluten feed	23%	2.60	76.3	21.3	0.48	0.82
Hominy feed	white	2.54	84.5	8.0	0.22	0.71
B. Requirements:						
for 18% total protein			74.2	14.7	0.14	0.55
for 24% total protein			74.2	19.9	0.21	0.67

^a Arithmetic averages of quotations from October through September, dollars per 100 pounds.

^b Pounds of each element in 100 pounds of feed.

The first column of Table I shows the average quoted prices of 10 feeds in Kansas City for the period from October 1949 through September 1950. For the purpose of this analysis, I assume that a dairyman or feed manufacturer must select some combination of feeds from among these 10, and that he must pay exactly the average quoted price.

The remaining four columns in Part A of the table show the nutritive content of each of the 10 quoted feeds, as given by Morrison.³

Part B of the table indicates two sets of nutritive requirements used for the purpose of the present study. These requirements are also obtained from Morrison. The figures in the first line of Part B show the average content of six typical dairy rations, published on page 1172 by Morrison, each containing approximately 18 percent total protein. The figures in the second line of Part B show the average contents of six rations, published on page 1173, each containing approximately 24 percent protein.

I assume for the purpose of this study that any combination of feeds meets all nutritive requirements for an 18 percent protein ration if it contains at least 74.2 pounds of total digestible nutrients, at least 14.7 pounds of digestible protein, at least 0.14 pound of calcium, and at least 0.55 pound of phosphorus. Likewise, I assume that any combination of feeds meets all nutritive requirements for a 24 percent protein ration if it contains at least 74.2 pounds of total digestible nutrients, at least 19.9 pounds of digestible protein, at least 0.21 pound of calcium, and at least 0.67 pound of phosphorus. This ignores the possibility that overconsumption of some nutrient might be harmful—an aspect of the problem which doubtless should be studied.

In addition to the nutritive requirements, I shall assume that a feed manufacturer may require a combination of feeds which weighs at least 100 pounds, since he sells feed by weight. I therefore consider four possible sets of requirements—two indicated by the two rows of Part B, Table I, and two more with the additional requirement that the combination of feeds weigh at least 100 pounds. Each of these four sets of requirements is to be met by some combination of feeds selected from the 10 feeds listed in Table I, and we must find the least expensive combination.

Least Expensive Source of a Single Requirement

The first step in our analysis is to compute from the data in Table I the proportion of each requirement which can be supplied by one dollar's worth of each feed. For example, 100 pounds of corn supplies 78.6 pounds of total digestible nutrients, at a cost of \$2.40, and either ration requires 74.2 pounds of digestible nutrient. So one dollar's worth of corn supplies

$$\frac{78.6}{(2.40)(74.2)} = 0.441$$

times the required amount. In general, let X_{ij} represent the pounds of the j th nutrient in the i th feed, let p_i represent the price of the i th feed, and let r_j represent the required amount of the j th nutrient. Then we compute

$$Y_{ij} = X_{ij}/p_i r_j$$

³ F. B. Morrison, *Feeds and Feeding*, 21st edition, pp. 1172 and 1173.

The values of Y_{ij} are shown in Table II.

As a first step in the analysis we consider the least expensive source of each individual requirement. This is found by locating the maximum value in each column of Table II. Thus, the least expensive source of total digestible nutrients is milo maize, of digestible protein it is soybean meal, of calcium it is gluten, of phosphorus it is bran, and of weight it is bran.

Note that a single feed always provides a single requirement at less

TABLE II. Y_{ij} , PROPORTION OF REQUIREMENTS SUPPLIED BY \$1 WORTH OF EACH FEED

Feed	Proportion of Required Amount of				
	TDN ^a	DP ^b	Ca ^c	Ph ^d	Weight ^e
A. Values for 18 per cent protein feed					
Corn	0.441	0.184	0.060	0.205	0.417
Oats	0.375	0.254	0.255	0.245	0.397
Milo maize	0.495	0.275	0.098	0.250	0.459
Bran	0.423	0.436	0.467	1.096	0.467
Flour middlings	0.436	0.449	0.264	0.529	0.410
Linseed meal	0.272	0.541	0.767	0.409	0.262
Cottonseed meal	0.268	0.628	0.403	0.625	0.281
Soybean meal	0.286	0.682	0.502	0.290	0.270
Gluten	0.395	0.557	1.319	0.573	0.385
Hominy feed	0.448	0.218	0.619	0.508	0.394
B. Values for 24 percent protein feed					
Corn	0.441	0.136	0.040	0.168	0.417
Oats	0.375	0.187	0.170	0.201	0.397
Milo maize	0.495	0.203	0.066	0.206	0.459
Bran	0.423	0.321	0.312	0.900	0.467
Flour middlings	0.436	0.332	0.176	0.434	0.410
Linseed meal	0.272	0.400	0.511	0.336	0.262
Cottonseed meal	0.268	0.464	0.268	0.513	0.281
Soybean meal	0.286	0.504	0.335	0.238	0.270
Gluten	0.395	0.412	0.879	0.471	0.385
Hominy feed	0.448	0.158	0.412	0.417	0.394

^a Total digestible nutrients

^b Digestible protein

^c Calcium

^d Phosphorus

^e 100 pounds

The last column shows the fraction of 100 pounds of each feed which can be bought for one dollar. This may, or may not, be considered a requirement.

expense than any combination of two or more feeds. If the buyer were concerned only with total digestible nutrients, he should buy milo maize only.

It is also important to note that a single feed may provide the least expensive source of two or more requirements. One hundred pounds of bran not only is the least expensive source of total weight; it also provides more phosphorus than needed in either ration, and as much calcium as required in the 18 percent protein ration. Thus, in the case of the 18 percent ration, bran alone is the least expensive source of calcium, phosphorus, and weight

together;—but it is deficient in total digestible nutrients and in digestible protein. In a different price situation it is quite possible that a single feed might provide all requirements at less expense than any combination of two or more feeds. Thus, in April 1951 the quoted price of gluten was lower than for any other feed—or gluten was the least expensive source of weight. In this case, it is easy to see from Table I that 100 pounds of gluten would supply all five requirements for either the 18 percent protein ration or the 24 percent protein ration. Therefore, in April 1951 the least expensive feed meeting all the specified requirements was gluten alone, unmixed with any other of the listed feeds.

But with the average prices of 1949–50 the buyer would have needed at least two feeds to meet all requirements at the least possible cost.

Least Expensive Source of a Pair of Requirements

The next step in the analysis is to discover the least expensive combination of feeds which meets two requirements. This combination will not include more than two feeds.⁴ And if the least-cost combination of two feeds which meets some two requirements, happens also to meet all other requirements, it is obviously the least-cost combination meeting all requirements.⁵

We shall now present a graphic method of finding the least-cost combination of two feeds meeting two requirements. For illustration we shall consider combinations which meet the requirements of total digestible nutrients and digestible protein in the 24 percent protein ration, as shown in Table IIB. The Y_{ij} values for each of the 10 listed feeds are plotted in Figure 1. For example, the appropriate values for corn are $TDN=0.441$ and $DP=0.136$. So we locate corn by measuring 0.441 unit to the right of the origin and 0.136 unit upward.

The diagram demonstrates that a combination of a substantial amount of gluten and a smaller amount of middlings meets the following tests:

- a. It is *feasible*, since it does not require negative purchases of either feed. Geometrically, the test of feasibility is that a line joining the dots representing gluten and middlings cross the 45 degree line shown in the diagram.⁶

⁴ If the two requirements are provided most economically by a single feed, one of the requirements will be met exactly and the other will generally be exceeded. If the most economical source is a combination of two feeds, both requirements will be met exactly. Geometrically, this means that the least-cost combination of two feeds meeting two requirements will lie exactly on the 45 degree line of Figure 1. Once the least-cost combination of two feeds has been located (in this case, gluten and middlings), it can be shown from Figure 1 that any mixture of these two with one or more additional feeds will prove to be a more expensive source of the two requirements.

⁵ This follows from the preceding footnote, since no possible combination of three or more feeds will meet the initial two requirements as cheaply as the least-cost combination of two feeds.

⁶ If the point of intersection were midway between the two dots, the least-cost combination would require equal expenditures for each feed. If the point of intersection were one fourth of the way from gluten toward middlings, the least-cost combination would require expendi-

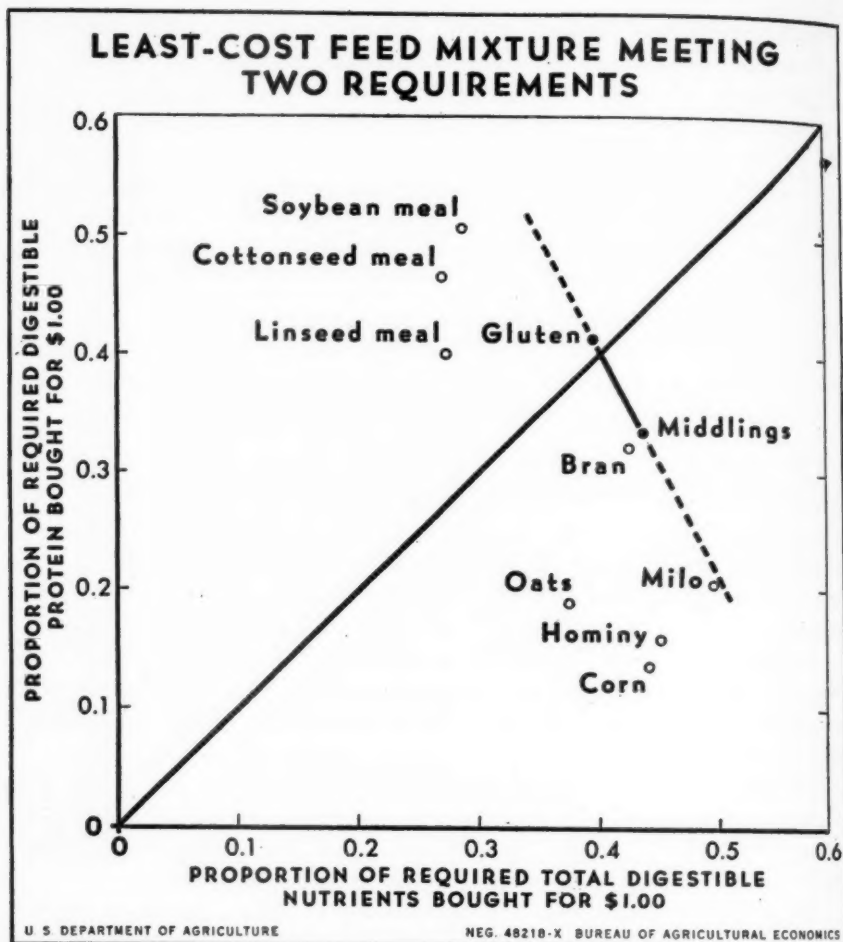


FIG. 1. LOWEST-COST MIXTURE MEETING TWO REQUIREMENTS

- b. It is *necessary*, since the two requirements cannot be met at less expense by dropping either feed. Geometrically, the test of necessity is that the line joining the two dots slope downward to the right. If it sloped upward to the right, we would buy only the one feed which was higher on both scales (i.e., the cheaper source of both digestible protein and total digestible nutrients).
- c. It is the *least-cost* combination of feeds supplying these two requirements. The geometric test of this is that no dot lie above the line (extended if necessary) joining the two feeds. If a dot did lie above the line it would indicate

tures for gluten three times as large as those for middlings. A combination of cottonseed meal and linseed meal would not be feasible, although from an algebraic standpoint a combination meeting both requirements can be found by extending the line joining the two feeds to its intersection with the 45 degree line. But this "combination" would require large *negative* purchases of cottonseed meal!

that the requirements could be met with less expense by substituting some other feed, either for gluten or for middlings.⁷

The above three principles are the key to linear programming.

Finally, it can be shown that this combination of gluten and middlings meets all four nutritive requirements. Thus, it is also *complete* if we do not require it to weigh 100 pounds. This test cannot be shown conveniently on the diagram, but it will be discussed in the following mathematical treatment.

Now let us cover mathematically the same ground we have covered graphically.

If we spend e_1 for middlings and e_2 for gluten, we require that

$$(1) \quad \begin{aligned} 0.436e_1 + 0.395e_2 &= 1, \text{ and} \\ 0.332e_1 + 0.412e_2 &= 1. \end{aligned}$$

The first equation states that the quantities purchased must exactly meet the TDN requirement, and the second that these quantities must exactly meet the DP (digestible protein) requirement.

The solution may be found by inverting the matrix,⁸

$$(2) \quad Y = \begin{array}{c} \text{middlings} \\ \text{gluten} \end{array} \begin{array}{cc} \text{TDN} & \text{DP} \\ \begin{bmatrix} 0.436 & 0.332 \\ 0.395 & 0.412 \end{bmatrix} \end{array}$$

which gives

$$(3) \quad Y^{-1} = \begin{array}{cc} & \text{sums of rows} \\ \begin{bmatrix} 8.49625 & -6.84649 \\ -8.14567 & 8.99117 \end{bmatrix} & \begin{array}{c} 1.64976 \\ 0.84550 \end{array} \\ \text{sums of columns} & \begin{array}{cc} 0.35058 & 2.14468 \end{array} \end{array} \quad \text{Total cost } \$2.49526$$

The sums of columns of Y^{-1} show that the expenditure for middlings is \$0.35058, and for gluten \$2.14468;—a total cost of \$2.49526. The combination is *feasible*, since the sums of columns of Y^{-1} are both positive (i.e., the combination does not involve negative expenditures for either feed).

The equation of the line joining the two appropriate points in the diagram may be found by solving

⁷ A combination of gluten and milo exactly meeting both requirements would be feasible but slightly higher in cost than that of gluten and middlings. Any mixture of the two combinations would meet both nutritive requirements exactly. But while such a mixture would be less expensive than the gluten-milo combination, it would be more expensive than that of gluten and middlings. This demonstrates the proposition of footnote 3 that the least-cost combination meeting two requirements will not include more than two feeds.

⁸ These equations could, of course, be solved by elementary algebra. The matrix method is chosen here because certain criteria relating to row-sums and column-sums can be conveniently generalized to sets of three or more requirements. Equation (1) becomes $eY=i$, and its solution is $e=iY^{-1}$. Equation (4) becomes $Ya'=i'$, and its solution is $a'=Y^{-1}i'$.

(4)

$$0.436a_1 + 0.332a_2 = 1$$

$$0.395a_1 + 0.412a_2 = 1.$$

The values of a_1 and a_2 are the sums of the first and second rows of Y^{-1} . The combination is *necessary* because both row-sums are positive. If one were negative, the line would slope upward to the right and one feed would be the cheaper source of both requirements.

This is the least-cost combination meeting requirements for TDN and DP because

(5)

$$1.64976Y_{11} + 0.84550Y_{12} < 1,$$

when the Y values of any other feed than middlings or gluten are used. (Geometrically, this means that no dot in Figure 1 lies above the line joining gluten and middlings.) For example, we can test whether corn is a substitute by computing

$$(1.64976)(0.441) + (0.84550)(0.136) = 0.84253.$$

Since this value is less than 1, the substitution of corn for middlings, or for gluten, would increase the cost of meeting the first two requirements. In a similar way we test each other feed, each time obtaining values less than 1, and therefore rejecting them.

The ration is *complete* except for weight, since \$0.35058 worth of middlings and \$2.14468 worth of gluten supply 1.94688 times the required amount of calcium and 1.16230 times the amount of phosphorus, as may be verified easily from data in Table IIB. However, it weighs only 96.944 pounds. If a manufacturer is concerned with total weight, this combination is incomplete.

If the buyer were concerned only with meeting the four nutritive requirements, the least-cost, complete, necessary, and feasible ration which could have been bought would be \$0.35058 worth of middlings and \$2.14468 worth of gluten, at a total cost of \$2.49526.

But now suppose the manufacturer says, "I sell feeds in 100 pound sacks. What is the cheapest combination of feeds weighing 100 pounds and meeting the nutritional requirements?" Many of my friends answer this in either of two incorrect ways. Some say, "Multiply each expenditure by $1/0.96944 = 1.03152$, obtaining 100 pounds at a cost of \$2.57391. Others say, "Add to the ration 3.056 pounds of bran, the cheapest feed, at 2.14 cents a pound. This increases the cost by 6.539 cents, making the total cost \$2.56065." The second answer is obviously better than the first, but both are wrong, and both miss the main point of the analysis.

A diagram similar to Figure 1 would indicate that a mixture of bran and gluten is the least expensive combination of feeds weighing 100 pounds and

supplying enough digestible protein. Without drawing such a diagram, we may proceed mathematically with

$$\begin{array}{rcl}
 & \text{DP} & \text{Weight} \\
 Y = & \begin{array}{l} \text{bran} \\ \text{gluten} \end{array} & \begin{bmatrix} 0.321 & 0.467 \\ 0.412 & 0.385 \end{bmatrix} \\
 Y^{-1} = & \frac{\begin{bmatrix} -5.59439 & 6.78592 \\ 5.98672 & -4.66441 \end{bmatrix}}{\begin{array}{cc} 0.39233 & 2.12151 \end{array}} & \begin{array}{l} 1.19153 \\ 1.32331 \\ \text{Cost } \$2.51384 \end{array}
 \end{array}$$

A combination of \$0.39233 worth of bran and \$2.12151 worth of gluten not only weighs 100 pounds and supplies the required amount of digestible proteins; it also supplies more than the required amounts of the other three nutrients. It is, therefore, complete. It is feasible, since the column-sums are both positive. It is necessary, since the row-sums are both positive. It is the least-cost combination because

$$1.19153Y_{41} + 1.32231Y_{42} < 1$$

for each feed other than bran and gluten.

Summarizing thus far, the least expensive feed at the average Kansas City prices of 1949-50 which meets the four nutritional requirements of the 24 percent protein ration was \$0.35058 worth of middlings and \$2.14468 worth of gluten—a total cost of \$2.49526. The least expensive combination meeting the nutritional requirements and weighing 100 pounds was \$0.39233 worth of bran and \$2.12151 worth of gluten—a total cost of \$2.51384. The second combination weighs 3.059 pounds more than the first, and costs 1.858 cents more.

The Least Expensive 18 Percent Protein Ration

In the case of the 24 percent protein ration, we have seen that the least-cost combination of feeds meeting two requirements happens to meet all others and thus is the least expensive mixture meeting all requirements. Such an easy solution is not always possible. With different prices, or with different requirements, we would generally need to proceed to analyze combinations meeting three, four, or five requirements. This cannot be done conveniently by graphic methods. But the mathematical tests used above apply to the general case of several requirements. This will not be proved here, but if the reader followed the proof of the two-dimensional case, he may be able to see intuitively that the same mathematical conditions apply in cases of three or more dimensions.

I shall proceed to apply the principle to discover the least cost combina-

tion meeting the requirements of an 18 percent protein ration. I shall start with the matrix, obtained from Table IIA,⁹

$$Y = \begin{matrix} & \text{TDN} & \text{DP} & \text{Ca} & \text{Weight} \\ \text{milo} & 0.495 & 0.275 & 0.098 & 0.459 \\ \text{middlings} & 0.436 & 0.449 & 0.264 & 0.410 \\ \text{gluten} & 0.395 & 0.557 & 1.319 & 0.385 \\ \text{bran} & 0.423 & 0.436 & 0.467 & 0.467 \end{matrix} = .$$

I proceed to invert Y by a method of "enlargement" based upon methods developed by Fraser, Duncan, and Collar.¹⁰ Let Y_2 represent the submatrix formed by the first two rows and columns of Y , Y_3 the submatrix formed by the first three rows and columns, and Y_4 the whole matrix. We proceed to invert each successively, obtaining

$$Y_2^{-1} = \begin{matrix} \begin{bmatrix} 4.38669 & -2.68673 \\ -4.25968 & 4.83611 \end{bmatrix} & \begin{matrix} 1.69996 \\ 0.57643 \end{matrix} \\ \begin{matrix} 0.12701 & 2.14936 \end{matrix} & \text{Cost } \$2.27637 \end{matrix}$$

⁹ These four feeds were chosen on the following, partly intuitive, bases: From Figure 1 and Table IIA it was evident that a combination of milo maize and middlings would be a feasible, necessary, and probably least-cost combination for meeting the TDN and digestible protein requirements of the 18 percent protein ration. The least-cost property could have been confirmed either by plotting the Y_{ij} values of these and other relatively promising ingredients on a chart such as Figure 1, or by applying the criterion, based on matrix Y_2^{-1} , that

$$(6) \quad 1.69996Y_{41} + 0.57643Y_{42} < 1$$

for all feeds other than milo and middlings.

The combination of milo maize and middlings also exceeded the minimum requirements for phosphorus. A combination of gluten and milo would have been only slightly more expensive than middlings and milo as a source of TDN's and digestible protein. Equation (6) applied to gluten gave a value of 0.99256. Gluten was a cheaper source of phosphorus than either milo or middlings and was also the cheapest source of calcium. Subsequent tests, using a criterion analogous to Equation (6), demonstrated that milo, middlings, and gluten provided the least-cost combination exactly meeting requirements for TDN's, digestible protein, and calcium. The criterion, based on matrix Y_3^{-1} , was that

$$(7) \quad 1.70215Y_{41} + 0.56970Y_{42} + 0.00783Y_{43} < 1$$

for all feeds other than the three chosen. The chosen combination was complete except for weight.

Bran was the cheapest source of weight (and phosphorus); it provided more calcium per dollar than did the milo-middling-gluten combination; and it would have been only a slightly more expensive substitute for middlings as a source of TDN's and digestible protein. Equation (6) applied to bran gave a value of 0.97041. Subsequent tests justified the choice of bran to complete the least-cost combination meeting all requirements. The criterion, based on matrix Y_4^{-1} , was that

$$(8) \quad 1.32322Y_{41} + 0.92175Y_{42} + 0.00371Y_{43} + 0.41634Y_{44} < 1$$

for all feeds other than the four included in this matrix.

The sets of equations included in matrix Y could all have been solved by elementary means such as the well-known Doolittle method. However, the calculations would have been much more laborious and the criteria based on row-sums and column-sums could not have been introduced.

¹⁰ R. A. Fraser, W. S. Duncan, and A. R. Collar, *Elementary Matrices*, Macmillan, 1947, pp. 112-118.

Incomplete (deficient in calcium and in weight), but feasible, necessary, and minimum cost.

Y_3^{-1}	4.57474	-3.16647	0.29388	1.70215	Cost \$2.27968
	-4.83802	6.31152	-0.90380	0.56970	
	0.67305	-1.71703	1.05181	0.00783	
	0.40977	1.42802	0.44189		

Complete except for weight, feasible, necessary, and minimum cost.

Y_4^{-1}	6.48494	5.15235	3.31116	-13.62513	1.32322
	-4.79815	6.48531	-0.84076	-0.28465	0.92175
	0.69368	-1.62708	1.08443	-0.14732	0.00371
	-2.08615	-9.09459	-3.29866	14.89574	0.41634
	0.29432	0.91599	0.25617	0.83864	Cost \$2.30512

Complete, feasible, necessary, and minimum cost.

Thus, buying at the Kansas City prices of 1949-50, and selecting only from the 10 quoted feeds, the least expensive combination meeting the four nutritive requirements of an 18 percent protein ration was \$0.40977 worth of milo maize, \$1.42802 worth of middlings, and \$0.44189 worth of gluten. And the least-cost combination supplying the nutritive requirements and weighing 100 pounds was \$0.29432 worth of milo maize, \$0.91599 worth of middlings, \$0.25617 worth of gluten, and \$0.83864 worth of bran.

Concluding Remarks

Some of my friends in the Department of Agriculture are inclined to doubt the acceptability of the rations presented above. They point out that none of the four rations include any oilseeds, and that neither of the 24 percent protein rations includes any whole grain. As a matter of fact, I have computed the minimum-cost 18 percent protein ration, also, using prices of Kansas City and of Minneapolis for 1937-41, for 1946-49, for January 1951, and for April 1951. In no case do these rations include any oilseeds, and only two of the eight rations include any whole grain. It may well be that these rations are unacceptable. If so, the stated requirements are not adequate, and should be improved.

But if the stated requirements are approximately right, it would appear that the mill feeds are relatively underpriced, that the whole grains are somewhat overpriced, and that the oilseeds are greatly overpriced relative to the prices of other feeds.

Since this paper was written I have read the excellent paper by Christensen and Mighell¹¹ which discusses the minimum-cost combination of corn and soybean meal used as hog feed. Their analysis represents a very restricted form of linear programming. With the techniques explained in the present paper, it should be possible to extend their analysis to a number of feeds.¹²

¹¹ R. P. Christensen and R. L. Mighell, "Food Production Strategy and the Protein-Feed Balance," *this Journal*, Vol. XXXIII, May 1951, pp. 183-191.

¹² The method of linear programming can in principle be applied to a good many other problems in agricultural economics. An example of such a problem would be to determine the least-cost combination of feeds (and perhaps other resources) which would enable us to meet or exceed specified production goals for each major livestock product. This would require technical coefficients relating output of each class of livestock to inputs of each type of feed, and information on the market prices (and perhaps resource costs) of each feed. The practical value of such an analysis would depend on the accuracy of our estimates of input-output relationships on the national level. For any given set of such estimates, however, the method of linear programming should lead to a unique least-cost solution.

AGRICULTURAL PRICE POLICY IN THE UNITED KINGDOM

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THE Agriculture Act, 1947, starts with the following words:

The following provision of this Part of this Act shall have effect for the purpose of promoting and maintaining by the provision of guaranteed prices and assured markets for the produce mentioned in the First Schedule of this Act a stable and efficient agricultural industry capable of producing such part of the Nation's food and other agricultural produce as in the national interest it is desirable to produce in the United Kingdom and of producing it at minimum prices consistently with proper remuneration and living conditions for farmers and workers in agriculture and an adequate return on capital invested in the industry.¹

This paragraph summarises one of the main objectives of the United Kingdom agricultural policy—a policy designed to assist the farming industry of the United Kingdom to acquire the stability, security, and efficiency which will enable it to play its part in the struggle for increased national production.

Part of the machinery set up to secure this objective is that concerned with the control of the prices of farm products. This machinery has come to be known as the Price Review System. The object of this article is to trace the evolution of the Price Review System and to indicate in broad outline how a Review is carried out.²

After a period of prosperity in the middle years of the nineteenth century, agriculture in the United Kingdom came to be regarded as the Cinderella of the industries. The Corn Production Acts of World War I, establishing minimum prices for agricultural products, provided only a temporary relief from a long period of depression—a period in which costs had pressed so hard against income that capital equipment became depleted and obsolete, and the courage and initiative of farmers, landlords, and workers alike were sapped. A further depression in the nineteen thirties turned the attention of farmers, economists, and statesmen to a further consideration of the possibility of cushioning the industry against the adverse effects of the free pricing system.

A model already existed in the sugar beet (1925) subsidy legislation, under which beet prices were left to find their own level in the market place and the farmers' financial position was relieved by subsidy payments.

¹ Agriculture Act, 1947—10 & 11 Geo. 6, Chap. 48, Part 1, Section 1.

² For a more detailed description of procedure reference may be made to *Annual Review and Fixing of Farm Prices, 1951*, published by His Majesty's Stationery Office, London. Cmd. 8239.

Legislation to assist farmers in the nineteen thirties proceeded partly as a further extension of this kind of help,³ partly by way of import regulation,⁴ and partly by way of marketing legislation.⁵

When war became a probability in the years preceding 1939, agricultural policy became more concrete and definite in its approach. It became apparent that if war did come the country would require the maximum output from British soil. The urgency of the situation was reflected in legislation; and the Agricultural Development Act of 1939 with its subsidy proposals for oats, barley, and fat sheep, and grants for ploughing up grassland marked a further step in the process of giving the farmer greater security in his production operations and so encouraging him to build up soil fertility in readiness for war.

Although the Agriculture Act, 1947, did not reach the Statute Book until two years after World War II ended, the years between 1939 and 1947 were a period of evolution and development. Mainly because of the urgent need for high farm production, but partly also because of a general realisation of the importance of agriculture as a segment of the national economy, the ideas underlying the depression legislation of the thirties gradually crystallised into a more or less definite war and ultimately a post-war policy.

Most of the policy in the Agriculture Act, 1947, was not new, and many of the institutions required to implement the policy had been in operation for a number of years. The War Agricultural Executive Committees from 1939 onwards, for example, provided many valuable lessons of ways in which efficiency control might be attempted. Considerable experience had also been gained in the mechanics of price control.

Almost immediately after the outbreak of war in September 1939, prices of many farm products were taken out of the realm of free pricing, partly in the interests of farming stability, partly to prevent excessive price movements of home farm products, and partly to facilitate control of commodities which overnight had become national necessities.

Judged by results in terms of farm output and the over-all level of farm prosperity, the outcome of these early efforts must be regarded as satisfactory. In general the desired home output of farm products was obtained. The control almost inevitably resulted in a number of income inequalities among farmers of different types and abilities, but these were ironed out as far as possible. Subsidies and special payment devices were used to supplement the income of some farmers. For example, marginal agricultural production assistance, potato acreage payments, and hill sheep subsidy were used both to encourage production from marginal areas and to raise the in-

³ Wheat Act, 1932, Cattle Industry (Emergency Provisions) Act 1934, Livestock Industry Act 1937, Agriculture Act, 1937.

⁴ Import Duties Act, 1932 and Ottawa Agreements Act, 1932.

⁵ Agricultural Marketing Acts, 1931 and 1933.

comes of farmers who were relatively disfavoured by the price controls adopted, or whose incomes could not be substantially raised by any reasonable price levels. At the other end of the scale, income tax and excess profit tax legislation dealt with farmers in specially favoured positions.

In the light of the circumstances of extreme urgency under which the controls were imposed, it is probably also true to say that the price machinery was reasonably satisfactory. The possibility of such control had been envisaged long before the war, and much thought had been given to the question of price fixing technique. The moment war was declared the prices of many of the major farm products were brought under some sort of control. In the absence of adequate economic data some of the early efforts were of the hit or miss variety, but a process of trial and error rapidly brought the general price structure into conformity with production requirements. But as prices of farmers' inputs began to rise a new factor intruded on the situation. Farmers' representatives began to press for income recoupment in respect to the increased costs they were incurring. At an early stage this pressure was recognised by the Government and in November, 1940, the Minister of Agriculture said in the House of Commons, "The Government has now decided to guarantee that the present system of fixed prices and an assured market will be maintained for the duration of hostilities and for at least one year thereafter. Prices will be subject to adjustment to the extent of any substantial changes in cost of production."⁶ This assurance was the background to the price negotiations during the next four years. The agricultural press was inclined to place it in the forefront of their price commentaries. The statement became known as the "pledge" and was magnified almost into a price control principle, so much so, in fact, that in many quarters agricultural price control was regarded as a piece of "cost plus" machinery. This was, in fact, never the case. The principle of recoupment was recognised on a global rather than an individual farm and commodity basis; and in fixing the prices for individual products many factors other than costs were taken into account.

Negotiations did not always run smoothly. Farmers and the Government disagreed occasionally about the appropriate price level for agricultural products and about the exact meaning of the pledge itself. In January 1944, the Minister of Agriculture reviewed the history of wartime pricing of agricultural products and foreshadowed the present price review system. The importance was recognised, first, of having basic economic data available to and agreed upon by both the farmers and the Government; and second, of having a clear understanding of the method of using the economic data.⁷

⁶ *Parliamentary Debates* (Hansard). Fifth Series—Volume 367. 26th November, 1940. Published by H. M. Stationery Office.

⁷ *Parliamentary Debates* (Hansard). Fifth Series—Volume 396. 26th January, 1944. Published by H. M. Stationery Office.

The next link in the chain of events was the announcement in the House of Commons in May 1944 of a new four-year plan covering the period to the end of the summer of 1948: "The Government has decided to guarantee to producers of milk, fat cattle, calves, sheep and lambs an assured market for their whole output of milk and meat during the four years up to the summer of 1948 at price levels not less than those at present prevailing. . . . These will be guaranteed minimum prices. . . . Actual prices, which may exceed these minima, will be settled year by year in the light of all relevant circumstances after consultation with representatives of the appropriate farmers' organisations. . . ."⁸ The emphasis on the consideration of *all* relevant circumstances and the acceptance of the principle of consultation with farmers' organisations will be noted.

During the summer of 1944, discussions went on between the Government and the farmers about arrangements for implementing this four-year plan, and in particular, about the type of economic data to be presented. The discussion culminated in "a statement of procedure" in December 1944.⁹ The Government agreed that the economic data used in the price discussions would be based on financial accounts and cost of production data, collected by means acceptable both to the Government and the farming industry. Price reviews would be held in February of each year and provision would be made for special reviews whenever circumstances suggested that they were necessary. Prices for crops would be made known well in advance of production. The assurance of markets for milk, livestock, and eggs, and a guarantee of minimum prices for fat cattle, calves, sheep, lambs, and milk up to the summer of 1948 was reaffirmed.

The first annual review of prices took place in February 1945. In November 1945, before the second review, the Government announced its post-war agricultural policy.¹⁰ It was indicated that the price review system originally announced for the 1944-48 four-year plan would be continued after 1948, and more detail was given about the forward pricing aspects of the policy. Prices for cereals, potatoes, and sugar beets would be fixed 18 months before the harvest.¹¹ The minimum price guarantees for livestock and livestock products were extended beyond 1948, and fat pigs and eggs were brought within its ambit.

One of the most important features of the plan was the reaffirmation of the decision that prices should be fixed and announced in time for farmers to take production decisions with a knowledge of the prices they would

⁸ *Parliamentary Debates* (Hansard). Fifth Series—Volume 400. 25th May, 1944. Published by H. M. Stationery Office.

⁹ *Parliamentary Debates* (Hansard). Fifth Series—Volume 406. 5th December, 1944. Published by H. M. Stationery Office.

¹⁰ *Parliamentary Debates* (Hansard). Fifth Series—Volume 415. 15th November, 1945. Published by H. M. Stationery Office.

¹¹ Thus, at the review held in February 1951, the crop price decisions related to the crops which will be harvested in the summer of 1952.

receive for the product. It was easy to implement this part of the plan for crops, but livestock and livestock products presented greater difficulty. It was to overcome this difficulty that the system of minimum price guarantees operating on overlapping four-year periods was devised. For livestock and livestock products there would be two sets of prices, (a) actual prices which would be known up to about a year ahead and (b), minimum prices which would be known three or four years ahead. More specifically, at each annual review, prices of livestock and livestock products are now fixed for the 12 months beginning April 1 of the same year. In addition, in each alternate year beginning in 1948, the Agricultural Ministers are required to fix minimum prices for cattle, sheep, pigs, milk, eggs, and wool.¹² In accordance with this undertaking, minimum prices were fixed in 1948 for the years 1950-51 and 1951-52. In 1950 minimum prices were fixed for 1952-53 and 1953-54. In 1952 attention will be given to the years 1954-55 and 1955-56.

The price review deals with most but not all farm products. The list originally comprised wheat, barley, oats, rye, sugar beets and potatoes, fat cattle, fat sheep and fat pigs, milk¹³ and eggs.¹⁴ Wool has since been added. These commodities together account for about 80 percent of the gross output from United Kingdom farms, and with the exception of the important class of horticultural products, cover all the major lines of output.

Legislative authority to review agricultural prices was subsequently written into the Agriculture Act, 1947; and Section 2 of the Act deals with annual and special reviews:

2. (1) As at such date in each year as the Ministers may determine they shall review the general economic condition and prospects of the agricultural industry.
- (2) If it appears to the Ministers at any time between two annual reviews . . . that there has been or there is likely to be a change in the economic condition of the agricultural industry or any section thereof arising (otherwise than in the course of a continuous development) from a substantial alteration of costs of production or any other special cause, and that the change is or is likely to be of sufficient importance to require that the Ministers should exercise their powers under this subsection, the Ministers may hold a special review . . .¹⁵

The price review is conducted by representatives of the three government Agricultural departments¹⁶ and the three Farmers' Unions¹⁷ of the United Kingdom. Available for consultation are representatives of other govern-

¹² Wool has been added to the list since the original plan was announced.

¹³ Cow's milk (liquid).

¹⁴ Hen and duck in shell.

¹⁵ Agriculture Act, 1947. 10 & 11 Geo. 6. Chap. 48 Part I, Section 2. For a more detailed discussion of the differences between an annual and a special review reference should be made to Cmd. 8239, *Annual Review and Fixing of Farm Prices 1951* published by His Majesty's Stationery Office.

¹⁶ Ministry of Agriculture and Fisheries, Department of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland.

¹⁷ National Farmers' Unions of England and Wales, of Scotland and of Northern Ireland.

ment departments with an interest in the proceedings, departments such as the Ministry of Food and the Treasury.

It should be noted that price decisions are not taken at a price review. The task of the participants in the review is to examine the position and make recommendations—on an agreed basis if possible—about what they regard as appropriate price levels. The price decisions are taken by the Government.

Before these representatives meet in full session it has become the custom for the economists of the Agricultural Departments and the Farmers' Unions to have a series of preliminary meetings in order to reach provisional agreement on the general relevance and degree of reliability of the data. These meetings, together with the close contact which is maintained throughout the year between the economists of the two sides, have proved useful in facilitating an accepted view of the data presented.

A further preliminary is to decide on production objectives for the next two to four years. This matter is considered by government officials and the objectives are submitted to the Ministers for approval before the review starts.

After these preliminary meetings the review proper takes place. Before recommendations are made, consumer requirements, overseas sources, and home production potentialities as well as the economic position of farming are all brought into the picture. It is convenient to divide the data considered into two main classes.

First, there are the data describing the economic position of the farming industry both in total and by commodities and types of farming. These data are mostly subject to quantitative evaluation. Second, there is the information on the wider issues involved in the review. In this class is included matter bearing on the food import situation, balance of payments, farm capital requirements, and other factors of a general kind affecting either the well-being of the consumer or the ability of the farmer to do his job. Although not always as subject to quantitative estimation as the farm data, the importance of this information is great in the final evaluation of the position.

Three main sets of farm data are used.

(a) The first one is the aggregate net income calculations. This net income is the difference between receipts and expenses adjusted for any change in the value of farm inventories, of the whole agricultural industry of the United Kingdom. It is the income which is available before direct taxation to remunerate the farmer and his wife for their work and to provide a return on the farmer's capital investment. Two methods are used in making this estimate. The first, known as the "Departmental" calculation, treats the industry as one large farm. Receipts, payments, subsidies, and inventory charges are treated on a global basis. The second, known as the "Raised Sample" calculation, is based on farm accounting material obtained

from university Departments of Agricultural Economics in England and Wales (and from corresponding sources in Scotland and Northern Ireland).

(b) The second set of farm data is that relating to aggregate cost increases since the previous annual review.

(c) Third, information is presented about actual farm incomes and expenses for different types and sizes of farms. Some of these data are supplied by the university agricultural economists and some by the Farmers' Unions.

It will be recognised that neither the "Departmental" nor the "Raised Sample" calculation provides a precise measure of the aggregate net income of the farming industry. In fact, it is not so much the absolute level of net income that is important. Much more significant is the trend from year to year. This trend gives no information about profits and losses on different commodities or in different kinds of farming. But it does provide an indication of the magnitude of any over-all changes in farming income and sets a mark which is of value in keeping the subsequent commodity price discussion in line with reality.

The importance and value of a global rather than a commodity approach cannot be overemphasised. In a negotiation which by its very nature must be subject to a certain amount of give and take, a commodity approach would almost certainly get out of hand. An initial global agreement sets an over-all limit to subsequent decisions and insures that "take" in one commodity must be offset by "give" somewhere else.

Consideration of these aggregate figures and the more general class of factors noted above sets the stage for a discussion of the extent to which price levels of individual commodities should be adjusted. It is at this point that the economic data collected by the university economists¹⁸ come more closely into the picture.

Each Provincial Agricultural Economics Department in England and Wales, and in Scotland, and the economists attached to the Ministry of Agriculture for Northern Ireland collaborate in forming a common pool of economic data about farming in the United Kingdom.

These data consist of two kinds of material—farm financial accounts and cost data. The Conference of Provincial Agricultural Economists¹⁹ decides

¹⁸ The Provincial Agricultural Economics Service for England and Wales is attached to nine universities: Newcastle, Leeds, Manchester, Nottingham, Cambridge, London (Wye), Reading, Bristol (two Centres) and Aberystwyth. Members of the Service are fully integrated with the various universities. England and Wales is divided into provinces and in addition to university duties, each Centre is responsible for economic advisory and investigational work in one of the 10 provinces. Included in this work is the provision to the Ministry of Agriculture and Fisheries of economic data about farming in the area. Three similar Centres in Scotland are attached to agricultural colleges in Edinburgh, Glasgow, and Aberdeen.

¹⁹ There are two P.A.E. Conferences, one for England and Wales and one for Scotland. They are attended by the Heads of the P.A.E. Centres, by representatives of the Ministry of Agriculture and Fisheries Economics Division (the Department of Agriculture for Scotland in Scotland) and confer under the chairmanship of the Head of the Economics Division, Ministry of Agriculture and Fisheries (Head of the Farm Economics Branch, Department of Agriculture for Scotland in Scotland).

at intervals the appropriate contributions to be made by each Centre. The farm financial account material is grouped on a type-of-farming basis, a specified number of farm accounts being furnished in respect of each major farming type area. Resources are insufficient to permit each Centre to undertake commodity costs for all the commodities coming under the review procedure. Accordingly, each, by agreement, undertakes to keep the costs for four to five commodities each year. The length of time a commodity is costed is determined partly by national requirements and partly by local interest in the commodity. It may be one year or it may extend to three or four. Milk, partly because of its importance and partly because of special financial arrangements, receives special attention and is costed at all Centres every year.

After all factors are taken into consideration, annual average prices are recommended for the review commodities. These recommendations ignore future and unpredictable variations in production due to weather, diseases, and pests; and they take no account of future possible or even probable changes in costs with the exception of those which will arise from decisions already taken.²⁰

At a later stage the annual average prices are broken down on a grade and seasonal basis in such a way as not to conflict with the review annual average price.

It will be clear that a price review in the United Kingdom is in no sense of the word a "cost plus" procedure. Indeed, although many statistics are brought forward, it is, in many aspects, not a statistical procedure at all. In the fixing of commodity prices regard is always paid to the statistical data; but so many other factors, some of them of a qualitative kind, are taken into account that the final settlement often bears no traceable resemblance to any particular set of figures. Further, there is no evidence that the Government has ever recognised any datum line of farming profits toward which the price review could move in the preparation of recommendations. It is true that in the Agriculture Act, 1947, the farming industry has been guaranteed "proper remuneration and living conditions for farmers and workers in agriculture,"²¹ but the complex needs of the agricultural expansion program, the need for capital injection and many other factors could not be met with a rigid datum line of farm profitability.

The wording of the Act and the implementation procedure are of such a kind as to give the price review an unusual degree of flexibility. There is no rigidity such as that which characterised the Corn Production Acts of World War I and was a contributory factor to the breakdown of that legislation.

The Price Review System was first put into operation in February, 1945.

²⁰ E.g., a rise in wages already negotiated would be included but a possible or probable rise not already negotiated would be ignored.

²¹ Agriculture Act, 1947, 10 & 11 Geo. 6, Ch. 48, Part I, Section 1.

Since then there have been modifications in procedure and additions to the information presented, but its basic features have remained for seven successive annual reviews and a number of special reviews held either between or conducted concurrently with the annual reviews. As far as the wording of the governing legislation and the procedure adopted are concerned there seems to be no reason why any breakdown should occur in the future. The tone of the agricultural press and comments of farmers' spokesmen indicate that the industry appreciates the stability and security in production planning that the policy affords, and there is no evidence that the taxpayer objects to providing such a guarantee at a reasonable cost. It is true that the procedure has not yet stood the test of time. Throughout the whole of its operation prices have been rising. On many, and perhaps on all, occasions the farmers have not got all they expected. But across the board there has always been a price increase. The real test of the policy will come when the general price level and the national interest call for a net reduction in farmers' incomes. Mechanically there will be no obstacle, but if success is to be obtained, statesmanship of a high order will be required both from the farmers and the Government.

COOPERATIVE MILK MARKETING IN NORWAY*

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THE high degree of development of cooperative milk marketing and the extensive use of government legislation in behalf of milk and milk products in Norway are understandable when the significance of milk production in Norwegian agriculture is realized. The largest portion of agriculture's total income is obtained from milk production. The Budget Board for Agriculture (*Budsjettnemnda for Jordbruket*) calculated that in the fiscal year 1948-49, the income from milk production was 36.7 percent of the total agriculture income.¹ This percentage does not include the income from the by-products of milk production, such as meat, vital organs, and hide.

Two additional facts, which are just as important as the previous one, are that (1) milk production is carried on in all sections of the country and (2) nearly all farmers, whether on small or large acreages or in the mountains, on the island or on the flatter land of eastern Norway, are engaged in milk production. Producing milk is the chief occupation on by far the greatest number of farms in all parts of Norway; in 1939 more than 95 percent of the farms over five acres had milk cows.

Cooperative Marketing

The development of cooperative marketing can be divided into two phases: the first is the period up to 1930, when the producers' organization alone bore most of the burden of increasing the returns from milk production; and the second phase, from 1930 to the present, when the organizations and the government worked together in behalf of the milk producer.

The first cooperative creamery was established in 1856, and in the following decades many more were organized. These early creameries were engaged mostly in butter and cheese production. The organization of the milk producers into local cooperative creameries was the first step toward the regulation of the milk market; but it was not long before the producers realized that it was necessary to continue this development on a wider scale and, therefore, united the local associations in an economic area into a larger district cooperative. In 1881, these district organizations were united into a national union, the Norwegian Dairy Association (*Den Norske Meier-*

* The authors obtained material for this article while on the Olaf Halvorsen Fellowship of the American-Scandinavian Foundation, 1949-1950.

¹ "Melkeproduksjonens betydning i vårt land," by Paul M. Dalberg, *Norsk Landbruk*, No. 5 March 1950, p. 84.

iforening). This association was reorganized in 1920 and its name changed to the Norwegian Milk Producers' National Association (*Norske Melkproducenters Landsforbund*).

As most of the creameries were equipped for butter production and the making of one or more kinds of cheese, as well as the distribution of fluid milk (for the creameries not too far from the cities), they could easily shift to the type of production which was most profitable until an equilibrium was reached. During this period there was an import surplus of butter and the butter tariff was, therefore, a support for milk and milk products. But in the late 1920's, Norway began to have a seasonal overproduction of butter so that the economic effect of the tariff was reduced and the price of all milk was lowered.

The Producers' Association endeavored to hold the price for fluid milk on a higher level than production milk by working as a price cartel. It succeeded to some extent; but a cartel that has set prices without having control of the supply will always be weak. They realized that it was impossible to hold the price of fluid milk up without the expansion of sales cartels and that the cartels would not be entirely effective on a voluntary basis.

The cornerstone for the present structure of cooperative marketing of milk and milk products was laid in 1930 and 1931 with the formation of eight Milk Centrals or Pools. The Milk Producers' Association was reorganized as the top organization. But it was the Marketing Law (*Omsetningsloven*) in 1930 and later amendments which enabled the producers to construct the cooperative marketing system which they have today.² The purpose of the Marketing Law was to further the activities of the marketing cooperatives and to permit the levying of a per unit sales tax on approved agricultural products. The money received from the sales tax on milk ($\frac{1}{4}$ øre per liter of milk) is used to meet expenses of the Milk Producers' Associations' activities, the Dairy Laboratory, Marketing Board expenses, propaganda, etc. The principal innovations of the law were, first, that the government had taken a strong stand for agricultural cooperatives; and second, that the state had used its law-making faculty to help these cooperatives economically by giving them taxing power for approved products. In 1931 an important amendment was added, the so-called obligatory settlement or adjustment, which is the key point in the regulation of the milk market. All milk which is sold as fluid milk, even from producers who are not members of the cooperatives, is "taxed" for the benefit of that milk which is used for butter and cheese. The "settlement tax" met with considerable resistance, especially from the direct sellers; that is, from the milk producers who sold milk direct to consumers in and around the large cities and towns.

² Because of the Constitution of 1814, the *Storting* (Parliament) is supposed to be weighted in favor of the rural areas. The Constitution requires that the ratio be two to one between the number of representatives from the rural areas and the cities.

The constitutionality of the law was questioned and the case went to the Supreme Court, which declared it valid.

The Law set up a Marketing Board of eight members selected by the farmers' organizations, agricultural cooperatives, the consumers' cooperatives and the Chamber of Commerce. The Board is under the supervision of a committee of four members named by the Department of Agriculture; its function is to check on the Marketing Board and the cooperatives that receive funds from the sales tax.

Five of the Milk Pools are organized with the creameries as members; the producer is indirectly a member of the Pool through his membership in the local cooperative creamery. In three of the Pools the producer has direct membership. This system assumes that the individual creamery carries on as an independent company and that the economic settlement between the creameries shall take place in such a manner that they retain the advantages of efficient management and favorable production conditions, and conversely, that they must bear the result of poor management and unfavorable production conditions. It is the consensus that this more elastic organizational form, in which responsibility for management and production rests on the local level, is more suitable for Norwegian conditions.

The main function of each of the Milk Centrals is the regulation of the milk market by eliminating competition among the creameries in the Centrals' districts through the use of the obligatory settlement or adjustment. In addition, the Pools are doing effective work in rationalizing the smaller and poorly equipped creameries and systematizing the distribution of fluid milk by having only one creamery in each locality sell milk to retailers or directly to consumers through their own milk stores. There is no home delivery of milk in Norway today, but if there were, only one creamery would do the distributing in each locality.

The eight Pools are under the jurisdiction of the Norwegian Milk Producers' National Association. Besides coordinating the objectives of the Pools and eliminating competition among them, the Association represents the milk producers in all dealings with the Marketing Board; and with other farmers' organizations, the Association negotiates with the State. Before the war, the Producers' Association quoted prices for milk, butter, and cheese through a special price quotation committee, but during and since the war, maximum prices have been fixed by the State. The Association has its own technical office as well as a propaganda and information office. It is responsible to the State for the calculation and administration of the country-wide or national settlement instituted in 1942 and for various production subsidies. (Discussed below.)

During the latter part of the 1920's, high seasonal production of butter and cheese caused prices on the domestic market to decrease sharply and

in some years resulted in a complete collapse. The Norwegian Dairies' Export Corporation was organized in 1929 with 65 creameries, representing 50 percent of all the milk delivered to all the creameries in 1928, and had as its main function the regulation of the butter and cheese market by exporting the surplus production. However, the price of butter on the world market declined so far in the next few years that the export of butter was greatly reduced.

In 1931, the Export Corporation (now called Norwegian Creamery Sales Association) was reorganized. It made an agreement with the Milk Producers' Association whereby the latter pays the farmers' expenses in connection with the regulation of the domestic market for cheese and butter, on the condition that the Sales Association carry on its activities along lines approved by the Milk Producers' Association.

Since 1931 practically all the creameries have been members of the Sales Association. The Association is required to purchase at current price quotations all the butter and cheese the creameries have for sale. Through the building of cold storage plants, the sale of butter to margarine plants for blending, and sales abroad, the Association is able to stabilize the price level for butter and cheese quite effectively. In cooperation with the Milk Producers' Association, the Sales Association maintains quality control over the butter and cheese and stipulates the rules for the return of skim-milk and whey to the producers.

Cooperative Pricing Policy

The Milk Pools' pricing policy was to operate as a sales cartel; that is, they used price discrimination. Under usual conditions they operated, briefly, in this manner. First, they sold as much fluid milk as possible at the officially approved price. Then a percentage was used for the production of cheese, an amount sufficient to hold the price of cheese slightly above the butter price. The remaining portion of the milk production was used for butter manufacture. The cooperative organizations attempted to adjust the prices of milk and milk products, within the framework of the laws, so that the net income of the total milk production would be maximized.

The cooperatives were not entirely free to distribute the supply of milk among the various uses, but had to adjust their sales policy to remain within the price limitation which the Trust Control placed on fluid milk (not on cheese or butter). They had permission to decrease the price, but for any increase, official approval had to be obtained. That the cooperatives followed a correct price policy (using maximization of income as a criterion) can be questioned only from the standpoint of whether their total income would have been increased by charging a price for fluid milk which was less than the maximum allowed by the authorities. To have increased the price of fluid milk above the maximum allowed would have been profitable, as

shown by elasticity studies and because of the legislation which was in effect during the 1930's. Professors R. Frisch and T. Haavelmo, working with 1925-35 data, found the price elasticity for the country as a whole to be -0.87 , for all the larger cities -0.73 , and for Oslo -0.36 .³ Professor R. Mork of the Norwegian College of Agriculture made a study based on 1925-39 data and found the price elasticity to be -0.6 for the whole country and -0.01 for the Oslo market.⁴ The difference in elasticities among the three groups of Oslo, the larger cities and the whole country, was due to the income factor in the various markets. The average real income per person for the respective groups was 1,125 kroner, 800, and 443 kroner.

Holding the price of fluid milk at the Trust Control maximum obviously affected the low income groups and large families more than it affected others. In 1939, when milk production was becoming excessive and it was growing difficult to maintain the prices of milk products under the authorized marketing system, the Agricultural Board of 1939 (*Jordbruk-snemnda av 1939*) proposed to widen the demand for fluid milk and butter by price discrimination among income groups, using a rebate card system. It was suggested that the State provide a subsidy so that low income groups and families with many children could purchase milk and butter at reduced prices, retaining the maximum price for other consumers. It is clear that the milk producers would have had a larger increase in sales by using a definite amount for a rebate card system than the same amount for a general price reduction. The suggestion of the Board did not receive official approval because of the war.

Each of the creameries was given a quota on cheese production. The policy of limiting the supply of cheese seems to be correct, as investigations of the cheese market show that the price elasticity for cheese is about -0.4 to -0.5 .⁵ The regulation of the cheese market was effective. Cheese production increased only one million kilograms in the 1930-36 period, while butter production increased from four million kilograms in 1930 to 11 million kilograms in 1936.⁶

The policy of using all excess milk production for butter was partially correct. Studies of price elasticity for butter for the country as a whole and for the Oslo market show an elasticity of -2.3 to 2.4 in the significant range of the demand curve.⁷

³ "Etterspørselen etter melk i Norge," by R. Frisch and T. Haavelmo, *Statsøkonomisk Tidsskrift*, 1938, No. 1, pp. 1-67.

⁴ "A Survey of Studies on the Sale and Consumption of Milk," R. Mork, *Norges Landbrukshøgskole*, Vollebakk, 1948, p. 15.

⁵ *Etterspørselsanalyser for Landbruksvarer* by O. Aresvik, stencilled by Social-Økonomisk Institutt, University of Oslo, 1949, pp. 131-146.

⁶ *Organisering og Omsetning av Landbruksvarer*, Norsk Rikskringkasting Serieforedrag, J. M. Stenersen Forlag, Oslo, p. 32.

⁷ *Det Norske Smørmarked, Produksjon og Omsetning, Priser og Forbruk* by R. Mork, *Melding fra Norges Landbrukshøgskole*, 1943 pp. 264-306. Also, *Etterspørselsanalyser for Landbruksvarer* by O. Aresvik, pp. 122-130.

Early in the 1930's the oversupply of butter caused the price to fall below the cost of production, hence it became necessary to use methods other than natural economic forces to bring order into the butter market. The Creameries' Sales Association had endeavored to regulate the market by dumping abroad, but when the world price fell to very low levels, exports dropped considerably. At the same time, the view spread that it was wrong to supply foreign countries with cheap butter while there was a nutritional need within the country. In 1931, the Milk Producers' Association prevailed upon the *Storting* to pass a law requiring the margarine factories to blend a certain percentage of Norwegian butter into the margarine. The main provision was that the amount of blending should be varied so that the quantity of Norwegian butter which did not find sales on the domestic market at a price which covered the cost of production would be blended into the margarine.

The table below shows the importance of the blending law in disposing of the increased butter production.

TABLE I. DISTRIBUTION OF BUTTER ACCORDING TO USE, 1935-39.

	1925	1930	1935	1939
Distribution	1,000 kg	1,000 kg	1,000 kg	1,000 kg
Export Surplus	-454	-587	187	57
Private Consumption	2,546	4,205	5,358	4,927
Blending with Margarine	573	322	3,295	10,630
Returned to Producers			308	382
Armed Forces			103	
Hospitals and other State Institutions			73	293
Total	2,265	3,940	9,324	16,289

Private consumption declined from 1935 to 1939, while blending with margarine increased 222 percent. In 1939, the blending process used 65 percent of the total butter production, which resulted in margarine containing up to 30 percent butter.

In 1934, additional support for butter was secured when a sales tax was placed on margarine.

The tax was 10 øre per kilogram of margarine when the percentage of butter used was 10; it was decreased by one øre per kilogram for each percentage over 10, and was increased by one øre per kilogram for each percentage under 10. The money obtained from the tax was used to increase the price received by the milk producers.

This tax worked in two ways to aid the milk producer: (1) the higher price for margarine theoretically would cause the sales of butter to increase and (2) the funds obtained from the tax was paid out as a support to milk producers. The economic effect of an increased margarine price on butter consumption is shown by an investigation which found that the cross

elasticity was $+0.6$ in relation to an adjusted margarine price with constant real income and adjusted butter price.⁸

It seems evident that the over-all price policy was correct, but that it could not have succeeded without the support of favorable legislation.

The obligatory settlement or adjustment within each Pool, a distinctive feature of the Norwegian milk cooperatives, is a technique used to fulfill their pricing policy. Since 1942 there has been a national settlement among the Pools as well, which works on the same principle as the Pool adjustment. The Pool settlement was originally built upon the following main provisions: (1) the price for all milk was adjusted so that it would be a matter of indifference to the farmer for which type of production his milk would be used, fluid milk, butter, or cheese; (2) the price to the producers was differentiated according to the distance from the market, so that the producer nearer the market received more than the farmer a greater distance from the market. In other words, the transportation cost was borne by the individual producer. (3) The production costs of the individual creameries were not adjusted; and (4) the settlement procedure did not result in an equalization of price to the individual producers, for the creameries paid according to the fat content and a reduction test. These principles apply today with the exception of point two.

Each month the Pool calculates the adjusted basic price on the basis of the economic results of the entire Pool. Production costs or margins for the various types of production in the creameries are based on a so-called normal plant, that is, one receiving three million liters per year and using modern equipment. The Creamery Economics Institute (*Meieriskonomisk Institutt*) usually adjusts the production margin on January 1 of each year, after investigating the accounts of the creameries. If the production costs of a creamery are less than the calculated normal margin, there would be a profit and a better economic return to the milk producer in that local cooperative. And conversely, if the production costs are greater than the calculated normal margin, the milk producers in that area would receive a smaller return.

The economic result is not determined only by production costs, but also depends upon the production yield the creamery secures from its milk. The Creamery-Economics Institute bases its calculations on normal milk, which is obtained by chemical analysis of samples from all parts of the country. On the basis of this analysis an average of the fat content, milk, sugar, albumin, and solids is obtained. After practical investigation, the yields from normal milk by the various types of production are obtained. By this method a creamery with milk of high fat and mineral content would profit and the returns to the producer be greater.

⁸ *Det Norske Smørmarked* av R. Mork, pp. 264-306.

The price settlement or adjustment takes place through the monthly accounts which the creameries sent to the Pool in their district. The creamery reports on the milk utilization and the Milk Pool's debiting price forms the basis for the price adjustment.

Below is a simplified example of the adjustment procedure.

A. Fluid Milk Creamery.

This creamery receives, for instance, 100,000 liters of milk each month, all sold as fluid milk at a wholesale price of 36.8 øre per liter. The calculated production cost or margin for this type of creamery with a normal output is 4.6 øre per liter.

Gross receipts:	100,000 liters at 36.8 øre per liter	kr. 36,800
Less working margin:	100,000 liters at 4.6 øre per liter	kr. 4,600
Net receipts		kr. 32,200

B. Butter-Making Creamery.

This creamery also receives 100,000 liters of milk per month and all of it is used for butter production with return of the skim-milk and buttermilk. The normal production cost or margin for a butter-making creamery is calculated at 3.4 øre per liter and the yield of butter is calculated at 4.5 kilograms per 100 liters of milk. The creamery's receipts are as follows:

4,500 kg. of butter at kr. 5.35	= kr. 24,075
92,000 liters skim-milk and buttermilk at 7 øre	= kr. 6,440
Gross receipts	kr. 30,515
Less working margin 100,000 liters at 3.4 øre	kr. 3,400
Net receipts	kr. 27,115

The Milk Pool's net receipts are as follows:

Milk for direct sales	100,000 liters at 32.2 øre	= kr. 32,200
Milk for butter-making	100,000 liters at 27,115 øre	= kr. 27,115
Sum	200,000 liters	kr. 59,315

This gives an average price of 29,658 øre per liter. In addition comes the State consumer's subsidy (and in certain cases various state production subsidies also), which averages during the year 14.8 øre per liter, making the total per liter gross receipts of the Milk Pool 44,458 øre. From this gross price the Pool deducts expenses for administration, sales tax for the Marketing Board, contribution to the National Milk Producers' Association, etc. What remains, say 43.5 øre per liter, is the so-called basic price, which is the price the Milk Pool pays to all the creameries, and under normal production conditions and with normal milk the producers would receive 43.5 øre per liter also.

Because of the difference in milk utilization among the creameries

of the eight separate Pools, their basic price varied. However, in 1942, the Government permitted an increase in the price to the producer (retail price unchanged due to subsidy by the State), provided that the differential in basic prices among the Pools and among the creameries within each Pool were eliminated. This so-called national settlement or adjustment was essentially for the benefit of the Pools which did not have as great an opportunity to sell fluid milk, and therefore had to use a larger percentage of the production for butter and cheese and for the creameries farthest from the central markets. Therefore, the national settlement was of benefit to those producers in the mountain and fjord areas who could not shift their efforts, for a number of reasons, to crops which gave a higher return, as the producers closer to the larger population centers were able to do. It resulted in an increase of three to four øre per liter for the districts farthest from the central markets.

It has been calculated that, because of the cooperative marketing system and supporting legislation, 78 percent of the price that the consumer pays for milk goes to the producer.⁹ It must be realized, however, that this high percentage is possible to some extent because there is no home delivery of milk today. It is true that if there were home delivery of milk the price would be increased to cover the additional distribution cost. The percentage of the consumer's expenditure for milk going to the producer would decline, but would still be on a relatively high level.

Since the end of the war in 1945, at the request of the farmers' organizations, a number of regulations for the benefit of certain producers have been issued by the Department of Agriculture under powers granted to it by the *Storting*.

In 1945, a subsidy of three øre per liter was given to producers in the mountains and fjord areas. There is, in addition, a transport subsidy for the farmers who have an exceedingly long way to transport the milk from the farm to the creamery. The districts farthest from the central markets and those with difficult production conditions have benefited by this policy. In 1948, a subsidy was granted for milk producers on small farms which did not have the fjord and mountain subsidy. This amounts to three øre per liter also, but is limited to 150 kroner per year and is only for those who delivered under 15,000 kilograms of milk to the creameries in the preceding year. These subsidies are regarded as a means to aid the producers who, on account of unfavorable production conditions, do not receive the same economic result as other farmers. They have not been sufficient to eliminate the difference, however. Since the small farms have had a lower productivity than larger farms, the Norwegians believe that these special efforts are necessary. According to production records, the wage level in 1947-48 for farms under 50 dekar (about 12 acres) was only 0.95 øre per

⁹ Speech given at a meeting of Agricultural Cooperatives, 1947, p. 10.

hour, while the wage level for farms over 500 dekar (about 120 acres) was 1.88 kroner per hour.¹⁰ Most of the fjord and mountain farms are small and natural conditions place relatively greater limitations on alternative production. They do not have the same opportunities to exploit favorable price situations in plant production for direct consumption as the more favorably located districts have.

At the present time all milk is handled by cooperative creameries, with the possible exception of the sparsely populated area of northern Norway, where the producer sells directly to the consumer. The amount produced in the northern part is insignificant. There are no private creameries; however, the two plants engaged in the production of condensed milk are privately owned and obtain their milk from the cooperatives.

At the same time that there has been the desire for a leveling arrangement in favor of agriculture in relation to other economic sectors, there have also been developed a number of leveling methods within the field of agriculture.

Economic Effects

What has been the economic effect of cooperative marketing and government legislation in behalf of milk and milk products on prices, producers' income, the distribution of resources and on the consumer?

In the early years of the organization, 1930-33, butter prices fell from 2.91 kroner to 2.31 kroner per kilogram or 60 øre. During this same period, Danish butter prices fell from 2.45 kroner to 1.54 kroner per kilogram or 91 øre. The leaders of the cooperatives believe that without the regulating system in force at the time the price of butter on the Norwegian market would have been lower than that on the Danish market. Without regulation we could suppose that the decrease would have been more than double. Milk used for butter production would have been two to three øre lower than it actually was. The lower price for milk used for butter would have caused the price for milk used for cheese and consumption to be pressed down to the same level, resulting in an average milk price of under 10 øre per liter.

In the period before 1930, the net receipts from butter-making and for the different varieties of cheese were about the same. The net price for fluid milk was somewhat above the net price for production milk. It is believed that if the Milk Pools had not been formed, the "over" price for fluid milk would have been lost. The "over" price on fluid milk increased during the 1930's, the average for the period 1931-40 being 10 øre per liter.

A comparison of the wholesale milk price with the wholesale price index shows that from 1931-33 milk prices fell 10.8 percent, while the wholesale

¹⁰ *Driftsgranskinger i Jordbruket, 40, Regnskapsresultater 1947/48, Norges Landbruksøkonomiske Institutt.*

price index was unchanged. However, from 1933-39 the milk price increased 48.5 percent, while the wholesale price index increased only 27 percent.¹¹

Professor Rasmus Mork, in an analysis of the income effect of the milk marketing system, concluded that the regulation of the market increased the farmers' yearly income by about 60 million kroner.¹² This amounts to more than 25 percent of the gross income from milk production. The Milk Producers' Association calculates that the system of the 1930's increased agricultural incomes by at least 55 million kroner yearly, not including benefits from better production methods in the creameries and from rationalization of distribution.¹³

The amount of milk handled by the creameries increased during this period and resulted in greater efficiency and a better economic return. In 1930, expenses were about 18-20 percent of the gross price. Expenses as a percentage of the gross price increased somewhat in 1933 when the retail price was at its lowest, but later it went in the opposite direction; expenses in 1947 were less than 15 percent of the gross price. While the gross price was higher in 1939 than in 1929, expenses were considerably lower, in spite of the increase in the wholesale price index. Since 1937 there has been a steady decline in the number of creameries, partly due to better transportation facilities, but more especially because of the rationalization efforts of the cooperatives. The centralization of creamery production by combining the smaller installations makes for more efficient operation and a greater net return to the producer.

The marketing system and government legislation have altered the relationship between the near-market and distant-market (fjord and mountain producer) districts in favor of the latter. Production records show that if the milk price in 1938 is used as an index (100), the relative level in 1932-33 for the near-market district of Østland (East of Oslo) was 69.4 and 58.5 for the distant-market districts. Since that time all legislation regarding milk production has been in favor of the more remote producers. The fjord and mountain subsidy of 1948, the transport subsidy of 1948, the small farms subsidy of 1949 and the National Settlement of 1942 were all passed specifically to increase the incomes of the distant-market group of milk producers.

The table below shows the average price of milk after 1939 for the whole country and for districts various distances from the Oslo market.

The figures for 1939 show the decrease in the milk price received by producers as the distance from the Oslo market increases. The Oslo and Aas Cooperative Creameries were above the average in 1939, but below the average from 1946 to now; this situation was reversed for the more remote

¹¹ *Norges Offisielle Statistikk* (Norwegian Official Statistics).

¹² *Melkeomsætning og Meieridrift i Norge, 1930-40*, by R. Mork, A. W. Brøgger Boktrykkeri, 1941, p. 202.

¹³ Speech given at a meeting of Agricultural Cooperatives, 1947, p. 10.

TABLE II. MILK PRICES RECEIVED BY PRODUCERS BY DISTRICTS

Location	Miles from Oslo	Øre per liter					Relation to 1939
		1939	1946	1947	1948	1949	
Average for Country	—	18.8	40.3	44.9	45.7	45.8	(243)
Cooperative Creamery	Oslo	19.6	38.0	41.0	43.3	43.3	(221)
Aas Creamery	18	18.1	38.0	41.0	43.3	43.3	(239)
Lolen Creamery	84	17.3	37.9	41.0	43.5	43.8	(253)
Alvdal Creamery	194	16.6	40.4	44.1	46.0	46.0	(277)
Os Creamery	231	16.5	41.3	44.1	46.2	46.1	(279)

Source: *Materiale til Belysning av Utviklingen og Lønnsomhetsforholdene for Kjøttproduksjonen* by O. Aresvik, p. 48. (See Table IV)

districts of Alvdal and Os. The distant districts' price was nearly as much above the central market's price in 1949 as it was below in 1939. When 1939 is used as a base, the milk price for the Os Creamery was at an index of 279 in 1949, while the corresponding index for the Oslo Cooperative was 221. Although this is the result of the Government's production subsidy policy, paid from funds obtained by the regular tax system, it can be reasoned that it is really the milk producers on the larger farms nearer the central markets who bear a part of the burden (other than by their tax payments). Under the planned economy in Norway, agriculture is budgeted with a certain total income. A portion of the total is obtained from milk production. An increase in the maximum allowed to agriculture in the National Budget could have been secured by a general increase in the price of milk or a general subsidy, which would have benefited all milk producers. However, the increase in the agricultural budget was obtained by subsidies for the benefit of the milk producers only in the more remote districts.

During the 1930's the milk pricing system probably did not cause resources to remain in agriculture which otherwise would have gone over to industry. There was little or no opportunity to shift from agriculture to industry, because of unemployment in the cities. However, since the war the system has quite likely influenced resources to remain in agriculture. The labor market has been in favor of the seller since 1945 and agriculture has lost some 40,000 people since that time, but it seems evident that the figure would have been greater without the production subsidies. The Government has used the cooperatives to implement their agricultural policy, which has a strong social bias. It is likely that subsidies to increase the incomes of the fjord, mountain, and small farmers are permanent features of the milk pricing system.

The cooperative marketing program during the 1930's caused an increase in milk production and affected the distribution of the supply among the three types of uses of milk. As early at 1934, it was necessary to put a brake on the increased milk production. In that year, rationing of purchased concentrated feed was instituted; but it was replaced the following year by a tax levied on any feed purchased over a prescribed amount. The taxing

method did not give effective control of production, for the farmers' own feed production increased sharply. Toward the end of the 1930's the increased milk production began to be somewhat of a problem for the authorized system of regulation. However, the war turned an increasing liability into an asset. Since the war there have been greater increases in production in the distant-market areas than in the near-market districts.

Table III below shows the increase in the number of cows, production per cow, and total production for selected years from 1925 to 1950.

TABLE III. NUMBER OF MILK COWS, PRODUCTION PER COW AND TOTAL PRODUCTION 1925-1950. SELECTED YEARS.

Year	Number of milk cows	Production in kilogram per cow	Total production Mill. kilograms
1925	773,149	1,534	1,186
1929	755,135	1,603	1,232
1935	796,444	1,698	1,352
1939	864,336	1,761	1,522
1948	767,664	1,800	1,382
1950	807,500*	2,021	1,632

* Estimate of Budget Board for Agriculture.

Production is sufficient today to eliminate the need to ration fluid milk and butter. After the demand for cheese is satisfied, the producers may be in the same position they were in the 1930's.

Total milk production delivered to the creameries increased 85 percent from 1930 to 1940, while during the same period fluid milk use increased only 13 percent, cheese production 44 percent and butter production 328 percent. A comparison of the distribution of the total milk supply two years prior to the institution of the government-cooperative pricing system and the last prewar year shows the effect of the system. In 1928, 41 percent of the milk supply was used as fluid milk, while in 1939 only 28 percent was employed for this purpose. Cheese production used 19 percent of the total supply in 1928 and 16 percent in 1939, while butter production accounted for 21 percent and 53 percent respectively. Other production used 13 percent in 1928 and three percent in 1939.¹⁴ It is likely that factors other than the joint action of the Government and the cooperatives' pricing system (such factors as changes in consumers' preferences) influenced the distribution, but it cannot be doubted that the pricing system, which could have been maintained without supporting legislation, was the dominant influence.

The relation between the price for beef and milk will influence the direction of production. With the regulation of the milk market in 1930-31, the exchange value of beef declined in relation to milk and milk products, so

¹⁴ Other production such as powdered milk, condensed milk, ice cream, and feed for hogs.

that in the 1930's the exchange value of beef was substantially lower than in the 1920's. Milk production (that delivered to the creameries and that retained on the farm combined) increased by 21 percent from 1931-32 to 1939-40, while beef production during the same period increased a scant 10 percent. The raising of beef cattle, considered independently of the meat production which can be viewed in connection with milk production, showed even a smaller increase.

The table below shows the changes in the sources of beef by groups between 1927-28 and 1946-47.

TABLE IV. PRODUCTION OF BEEF BY GROUPS—1927-28—1946-47

Source	1927-28		1946-47		Increase + Decrease -	
	1,000 kilograms	%	1,000 kilograms	%	1,000 kilograms	%
Milk cows	13,155.3	34.3	13,330.8	41.4	+ 175.5	+ 1.3
Bulls over 2 years	3,776.8	9.8	1,341.7	4.2	-2,435.1	-64.5
Young cattle 1-2 years	8,920.9	23.2	4,903.6	15.6	-4,017.3	-45.0
Week-old calves	7,436.4	19.3	8,073.0	25.1	+ 636.6	+ 8.6
Other calves under 1 year	5,150.9	13.4	4,544.2	14.7	- 606.7	-11.8
	38,440.3	100.0	32,193.3	100.0	-6,247	-16.3

Source: *Material for the Understanding of the Development and Profitability of Meat Production*.—Budget Authority for Agriculture (*Materiale til Belysning av Utviklingen og Lønnsomhetsforholdene for Kjøttproduksjonen*,—*Budsjettneimnda for Jordbruket*.) by O. Aresvik, p. 4.

Milk cows and week-old calves both contributed larger percentages of the total beef production in 1946-47 than in 1927-28, while the percentages from bulls over two years old and young bulls both declined appreciably.

One can readily understand why this shift away from raising beef cattle to milk production has taken place by the following table. The profitability of milk production can be clearly seen.

TABLE V. CALCULATED COST PRICE AND SELLING PRICE PER KILOGRAM FOR MILK AND BEEF, FOR SELECTED YEARS

Year	Milk		Beef	
	Cost price øre	Selling price øre	Cost price øre	Selling price øre
1938-39	17.8	17.0	182	131
1939-40	17.2	18.1	173	112
1946-47	37.0	39.7	388	302

Source: Same as Table IV, p. 70.

The fjord and mountain subsidies undoubtedly stimulate milk production at the expense of beef, a production which for a number of reasons is more adaptable to the mountain areas and many fjord counties. The shortage of beef is due, to some extent, to the pricing system and the subsidies, and has necessitated the continuation of rationing. This development has caused

an extensive debate as to the correct price ratio between milk and beef. The farmers' organizations are not in favor of taking away the subsidy for the farmers with poor production conditions. They propose instead a general price increase for the best quality beef and veal.

Future Developments

The future developments in the cooperative milk marketing system depend upon two main factors, (1) the internal factors, that is, efforts which the cooperative organizations themselves can develop and (2) the external factors, the price, subsidy, and other relationships with the State.

The National Milk Producers' Association has given considerable thought to taking over the production and distribution of all ice-cream and condensed and powdered milk, the latter of which is now produced largely by a private company. Ice-cream is made by some of the cooperatives as well as by a number of private companies. As the cooperatives control the milk and cream supply, they could easily become the sole producer and distributor, if they are permitted to do so by the State.

Interest has been shown in the manufacture of desserts and other dishes which use milk, cream, butter, eggs, and cheese. Some of the larger creameries have entered the field of frozen vegetables and fruits, and it seems likely that this development will be expanded to include animal products.

The organization will continue its work to make the production and distribution of milk and milk products more efficient. There undoubtedly will be a reduction in the number of creameries and receiving stations, particularly the latter in the vicinity of the larger cities.

It is likely that milk production will continue to increase as long as the present price relationships between milk, beef, and wheat exist; and therefore the milk producers will soon be confronted with the same problem which was so prominent in the late 1930's. Present per capita milk consumption is higher than before the war, but if the consumer subsidy were reduced or removed or if there were a drop in national income, consumption of fluid milk would possibly decline appreciably. The organizations realize the necessity of beginning their propaganda and information program again on the prewar pattern, because with the increased access to other goods in the past year, there has been a tendency for milk consumption to decline in the low income groups. As long as the Labor Party is in power the use of a rebate card system for low income groups, as suggested by the Agricultural Board of 1939, is a possibility. However, these methods would not solve the problem. The question will be whether to use the methods of the 1930's, such as obligatory blending of butter with margarine, concentrated feed tax, and margarine tax, or to seek new ways. The Agrarian Party and the milk organizations wish to use the methods of the 1930's.

The present Government is not in favor of the blending of butter with

margarine nor of a margarine tax, because of the adverse affect on low income groups and families with many children. The State will endeavor to have resources shift over to beef and especially wheat production, and perhaps from agriculture to industry. They will accomplish this by increasing the price for wheat and beef, or by more rigid control of feed rationing than is present today, or by lowering the price of milk. If these methods are not effective they will possibly permit some dumping abroad, and as a last resort some blending of butter with margarine. It is unlikely that the State would allow the situation to continue to the extent that it would be necessary to use the blending process to the degree of the late 1930's.

It is likely that the price subsidy on milk, which now averages during the year 14.8 øre per liter, will be retained for some time. In April of last year price subsidies on all agricultural products were removed or reduced considerably, excepting those on milk and meat. The subsidy on meat was removed in the fall. The milk subsidy will be retained as an implement of agricultural policy and as a device to control the cost of living so as to check inflationary pressure.

Planned economy under the Labor Government has brought the co-operatives closer to the State than they were in 1939. It is true that the milk producers requested and obtained favorable legislation. But now, with the National Budget approach to economic activity, more rigid price control, regulation of foreign trade, and production subsidies of various kinds which are administered by the Milk Producers' Association and the Milk Pools, there is unquestionably a closer connection between them.

AGRICULTURAL PRICE POLICY IN SWEDEN

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I. Introduction

IF A very rough approximation is permitted, and the period under review is limited to that after the First World War, the dealings between Swedish farmers and the Government—and thus with consumers—may be divided into three separate periods.

First, the 1920's may be taken as a neutral period, when Swedish agriculture was in a position to compete in world markets. Sweden imported, for instance, breadstuffs, and exported butter and bacon, which meant that domestic prices of agricultural products generally followed world market fluctuations. There were admittedly protective duties, but their effect was not such as to cause domestic prices to differ greatly from those of world markets.

Second, the 1930's can be taken generally as a period of agricultural subsidies. As a result of the economic depression commencing in 1929, world market prices of foodstuffs fell so drastically that measures were taken to divorce domestic food prices from world market prices. To this end a series of price regulations was put into effect during the 1930's, covering both agricultural produce and to some extent the means of agricultural production. In speaking of the 1930's as a period of the subsidizing of agriculture, it must be emphasized that this should not be taken as a sign of the inability of Swedish farmers to meet international competition. It must be remembered that the world market prices which Swedish agriculture then had to compete with were unnatural prices (dumping was common) and had no real connection with the production costs of agricultural products in the different exporting countries. In the first place, the export prices of foodstuffs were sometimes lower than the domestic prices in the respective exporting countries. Furthermore, the prices of agricultural products in other countries were insufficient even to cover the production costs of the farmers there. Agriculture was beset with difficulties in nearly every country in the world where commercial farming was practiced.

Third—to continue this extremely brief division of time into periods—is the period from the beginning of the 1940's, when the prices of foodstuffs in our country have generally been lower, and in the case of certain foods, very much lower, than prices in other countries and on the world market—if in fact one can speak at all of world market prices during this period. The third period may to some extent be said to continue to this day, although the rise in prices in a number of instances appears to have evened out the differences in prices of agricultural products in our country and elsewhere.

II. Review of Regulation of Prices During the 1930's

An extremely summary review is given in the following of the regulation of prices during the 1930's already referred to, which may be said to have heralded the present system of price regulation.

The first sphere of production affected was sugar beets, in 1930. The sugar companies in 1932 undertook to pay higher prices for beets than those corresponding to the world market prices of sugar, and in return were granted the sole right to the import of sugar. The next measure was the regulation of grain prices. In 1930 and 1931 the prices of grain in Sweden were made independent of world market prices. When reduced prices began to hit animal products as well, price regulation was applied to the latter also. The most far-reaching measures were those relating to the so-called general milk regulation, which came into force in 1932. The milk regulation provided that a certain charge be levied (general milk charge) on all milk supplied to dairies. This charge was used as an export subsidy on butter. As exports of butter comprised only about one fifth of the total production, a comparatively small charge per kilo of milk gave a considerable premium per kilo of exported butter. By this means the domestic price of butter could be raised above the world market price.

In 1933 regulation was applied to the market for slaughtered animals, and in 1934 to the egg market also.

Coordination of Measures for Price Regulation.

It will already be clear, from the short summary of measures for the regulation of agricultural prices and production, that government action in the early stages was one-sided. Certain branches of production were favored. The result was a certain dislocation in production. This was the case with cereal crops. It became evident during the 1934 session of Parliament that, in the future, agricultural subsidies should as far as possible be directed to the advantage of all branches of agriculture equally. When prices were being fixed an attempt was made to obtain roughly the same relation between the prices of different products as had existed prior to the agricultural crisis.

Prices in Relation to the Price Levels of 1925-1929.

As from 1934-35, therefore, coordination of regulative measures can be said to have existed. The prices of agricultural products were fixed in a certain relation to the price level of the years 1925-29. The target set in 1934-35 was to achieve prices corresponding to 75 percent of those predominant in 1925-29. Thereafter a greater flexibility was gradually accepted. In 1936 the "75 percent level" was set as a minimum under which produce prices should not be allowed to fall. If the 1925-29 price level were reached, however, government regulation was to be abolished. In the following year,

1937, a new principle was established, and this applied in the main up to the first years of the war. Prices were to be allowed to fluctuate freely between 15 percent above and 15 percent below the 1925-29 level. Not until prices tended to break those limits should regulation again begin to function.

III. Calculations of Total Agricultural Income and Costs—Basis for Price Regulation

Since 1940, the regulation of prices of agricultural products and necessities in Sweden has been based on "the calculation of agricultural income and costs," even if the first calculations were not made up in quite the same way as later.

A special body (formerly a Special Committee of the State Food Commission, now entitled the Committee of Calculation Experts of the State Agricultural Marketing Board) is responsible for ensuring that the necessary investigations are made on every occasion when price negotiations are to take place. The work of investigation is divided between the State Agricultural Marketing Board (formerly the Food Commission) and the Institute for Agricultural Investigations,¹ Second Division (formerly the Investigation Division of the Federation of Swedish Farmers' Associations).

Basic Principle: Increase in Income to Cover Increase in Agricultural Costs Since the Production Year 1938-39.

During the period when the calculation of income and costs has formed the basis of price regulation, the principle involved has been that the calculated agricultural income for each year of production² was allowed to develop—in toto—in relation to the basic year parallel with production costs.

As the whole period during which the agricultural calculation has applied has been marked by a practically unbroken rise in prices, the principle can be expressed in another way, namely, that agriculture shall be guaranteed an income that *covers the increased costs* for each year of production as compared with the base year.

To this end, every estimate has been based on a comparison with the base year. This fundamental principle must be borne in mind, if the nature of the calculation is to be rightly understood. Questions have, for instance, sometimes arisen as to whether some item in the calculation were too high or too low. A minor divergence, however, is generally unimportant, as the aim of the calculation is to show the development of income and costs. The essential factor is, therefore, that correct figures are given of comparative changes from year to year relative to the base year.

Agriculture Considered as a Unit.

The calculation of agricultural income and costs is a total calculation in

¹ Financed by farmers' organizations.

² Production year is here understood as Sept. 1-Aug. 31.

the sense that the object of estimates is as far as possible to cover the income and costs of the whole of Swedish agriculture. Agriculture is in other words considered in the calculation as a unit—as a single concern. Thus the term total calculation.

The term should, on the other hand, not be interpreted as meaning that the calculation comprises the whole income and costs of production of agriculture. Such is in fact not the case. There are certain items both of income and costs which have been impossible to assess. Costs appear to be most completely accounted for. An instance is the estimate verified in October 1950 for the production year 1950-51, which shows income as accounted for in the calculation amounting to 3,186.5 million kronor, while accounted costs amount to 3,367.8 million kronor. It is thus impossible to make a direct comparison between income and costs, but in applying the calculation an index must be used. The procedure is that an investigation is made into the total income *required* (requisite income) so that the total income accounted for in the calculation shall show the same percentage increase as the total costs accounted for (cf. previous paragraph on fundamental principles). The "requisite sum of income" is obtained by applying an index for the calculated costs to the sum of income in the base year. The calculated surplus or deficit is then obtained by comparing requisite income with estimated income from the calculation, *which is assessed on the basis of the most recently established prices of products.*

Example of Application of Agricultural Calculation for Estimating Surplus or Deficit in Autumn Calculation, 1950.

	1938-39 (base year)	1950-51
a) Agricultural income (forecast for year 1950-51) according to calculation, million kronor	1,371.1 ^a	3,186.5
Do. index	100	232.4
b) Agricultural costs (forecast for year 1950-51) according to calculation, million kronor	1,465.9	3,367.8
Do. index	100	229.74
c) Requisite calculated income to cover increase in costs (costs index \times sum of income in basic year), million kronor		3,150
d) Surplus (a-c) or deficit (c-a), million kronor		+36.5

See footnote a, Table summary.

Calculations are based on current prices or on such changes in prices as have already been decided at the time of calculation. A surplus or deficit in the spring calculation is generally regulated by price adjustments fixed by negotiation, so that the calculation will balance after adoption of the new prices—i.e., income and costs will show the same percentage increase on the base year. On two occasions—one being in the spring of 1949—it has, however, been impossible to reach immediate agreement on the basis of the calculation.

Spring Price-Fixing and the Four Percent Rule.

Spring price-fixing since 1943. At first prices were fixed in the autumn

of the production year beginning September 1. In order, however, to be able to take prices into consideration in their planning of farming operations (planning of production), farmers wished prices to be fixed in the spring. A modified fixation of prices in the spring was first introduced in 1941. The relative prices of different products were then fixed early in the spring, while the absolute price level was not fixed until the autumn. In 1943, however, a complete spring price-fixing was achieved, and has been normally adopted since then, and in fact has been recommended by Parliament. The fixing of prices in the spring is of fundamental importance. Farmers thereby obtain a valuable security. Yet it is clear that a spring price-fixing—normally in April—can scarcely be considered a fully effective means of attaining the object in view, which is the planning of production with due consideration to prices. In the south of the country spring sowing has often already commenced by the time that price agreement has been reached. But even when this is not so, the planning of production at so late a time can only be adjusted within comparatively narrow limits, for as far as the disposition of acreage is concerned, the planning of production must in the main be determined earlier (for instance, when fertilizers are purchased). It is, however, obvious that the fixing of prices in the spring is of great importance despite its limitations, particularly because the planning of animal production is to some extent determined during the summer when fodder crops are available.

The forecast, which is completed in February of every year (spring calculation) and forms the basis of price negotiations for the production year commencing on September 1, is a *standard calculation*. It is based on the assumption of a *normal harvest*, as the actual harvest for the production year is completely unknown. Due to the generally large variations in harvests, a standard calculation can of course give results that differ considerably from the actual figures. The spring price-fixing has therefore been combined with the so-called *four percent rule*.

The forecast, based on normal harvest, that is made in February and forms the basis of spring price-fixing, is generally checked in August against the preliminary harvest estimate made on July 15. The prices of the means of production for the coming production year can also be better assessed at this time than when the spring calculation is made. *If the estimates show a surplus or deficit of more than four percent of the sum of income reckoned in the spring agreement, an adjustment of prices is normally made in relation to the excess amount.* This is what is meant by the four percent rule. An adjustment is made only when the surplus or deficit exceeds four percent. Farmers thus normally stand a risk of losing four percent out of total income but have also a chance of gaining an equal amount.

The Calculation Supplemented and Improved.

It has been mentioned in the introduction that the calculation does not

cover all income and costs of farmers. All the more important items, however, are accounted for, and those that are lacking would probably not cause any great changes in the index, which is the determining factor in price fixation. The main criticism of the calculation is rather to be made on other grounds. Through investigations that have been made into methods of improving the calculation, changes have, however, been brought about in the course of the years. Since 1943, for instance, consideration has been given to the changes in farmers' operating capital, i.e., assets in the form of animals, fodder stocks, etc. An increase in assets (by increased stock of cattle, fodder reserves, etc.) is thus considered as income, while a decrease (by consumption of fodder reserves, slaughter of animals, etc.) is deducted from the calculated sum of income. This adjustment has sometimes been of great significance at times of dislocation due to poor harvests and consequent slaughter of livestock above normal.

Negotiation Procedure.

It was stated in the introduction that the agricultural calculation is prepared under the guidance of a committee of experts from the State Agricultural Marketing Board (formerly the Special Committee of the State Food Commission). Once the experts have completed their work, the calculation is handed over to the State Agricultural Marketing Board and is examined by the Board's Advisory Council, on which are representatives of farming, commerce, the food industry, Consumers' Cooperative Association, etc. After examination by the Board and its Advisory Council, negotiations are normally conducted between the Board and farmers' delegates. (The six farmers' delegates are appointed by the Boards of the two large farm organizations, the Federation of Swedish Farmers Associations and the Farmers' Union.) A preliminary agreement has generally been reached between the Board and the farmers before the former presents its proposals to the Government regarding the fixation of prices. Proposals are usually accepted without particular amendments by the Government, which finally submits them in the form of a bill for the approval of Parliament.

Orientation Regarding the Different Items in the Calculation.

The income side of the calculation is intended to illustrate the trend of total agricultural income, consisting of sales to the public plus the value of produce consumed by farming households and used as payment to laborers. This can be expressed in another way, namely, that the purpose of the calculation is to show as nearly as possible the value of the end products of agriculture. Internal turnover, i.e., products sold by farmers to each other (e.g., hay, straw, and other fodder) is not included in income. Internal turnover cannot of course be included in a calculation of the changes in the income of agriculture considered as a unit. Sales between farmers are comparable to

the turnover between different branches of an agricultural enterprise under the system of private agricultural accounting.

Particular interest is naturally attached to the income from milk and dairy produce, which amounts at present to 1.460 millions of kronor, or nearly 46 percent of the total calculated income. The income from this produce is based on statistics from the National Association of Swedish Dairies—without doubt the most complete dairy statistics in the world. When the forecast is drawn up, a theoretical estimate is made of the probable average price to be paid to farmers, taking into account what products the milk is used for, the price of those products, and the average dairy costs per kilo of milk for each product. The price of milk that has been theoretically estimated in this way for the last ended production years *is compared with the actual price paid during the same years*. A difference is then obtained (positive or negative), which is added to or subtracted from the estimated price for the forecast year. By this method the estimated income from milk and dairy products is intimately bound to the average prices actually paid. Separate estimates are made of milk sold by farmers direct to consumers and consumed by the farmers themselves, but no comments will be made here on this point.

During the rationing period, estimated income on meat and pork could be arrived at from the rationing statistics. Estimates now have to be made up from inspection statistics, census of livestock, statistics of sows covered, etc. These estimates can hardly be considered as reliable as those for dairy products.

The Costs Side of the Calculation. Just as an attempt is made on the income side to follow the annual changes in the total value of the end products of agriculture (in as far as they are accounted for in the calculation), it is also desired, on the costs side, to find an expression for the change in the total production costs for agriculture (as far as they can be accounted for). Included among costs therefore are, for instance, wages not only to employed labor, but also to cover the work performed by farmers and their families on an equivalent basis. Estimated interest costs are also included, both on loans and on capital that the farmers invest in their own farms.

The different groups of income and costs included in the calculation will be found in the table summary.

This surplus lies within the "four percent limit" and therefore calls for no readjustment, as the calculation in the example is an autumn calculation or check calculation (cf. discussion on "spring price fixing and the four percent rule").

If the corresponding calculation is made for the year 1949-50 on the basis of the figures now obtained of income and costs, there is a surplus of 99.0

SUMMARY OF AGRICULTURAL INCOME AND COSTS ACCORDING TO THE AUTUMN CALCULATION
1950, INCLUDING A FORECAST FOR THE PRODUCTION YEAR 1950-51.
ALL VALUES IN MILLIONS OF KRONOR

	1938-39 (base year)	1949-50	1950-51
A. Income			
Breadstuffs	153.9	260.6	231.9
Other grain	31.3	46.7	47.3
Potatoes and sugar beets	110.3	266.9	257.7
Straw fodder	5.9	9.4	6.8
Oil and textile crops		178.9	182.6
Vegetables	13.9	47.2	43.2
Total vegetabilia	315.3	809.7	769.5
Milk and dairy produce	601.6	1,432.7	1,460.9
Eggs and poultry	81.0	183.1	191.2
Slaughter animals	365.8	775.1	763.2
Et cetera	7.4	3.4	5.2
Total animalia	1,055.8	2,394.3	2,419.5
Changes in livestock capital		-12.1	-2.5
Total income	1,371.1	3,191.9	3,186.5
Index 1938-39 = 100	100.0	232.8	232.4
B. Costs			
Labor costs	833.4	1,969.0	1,968.4
Capital costs			
Soil drainage	7.5	17.1	16.5
Farm buildings	76.4	146.9	157.1
Machinery and equipment	78.0	234.8	251.3
Electricity	17.5	38.3	40.3
Interest	208.0	289.3	296.0
Supplies			
Fuel and lubricants	13.1	60.9	73.9
Fertilizers and lime	66.7	187.1	187.5
Purchased feeding stuffs	98.2	190.8	206.7
Miscellaneous	20.3	43.6	44.7
Freights etc.			
Freights	27.8	84.0	81.4
Milk control	1.9	5.9	5.9
General expenses	17.1	38.1	38.1
Total costs	1,465.9	3,305.8	3,367.8
Index 1938-39 = 100	100.0	225.5	229.7
C. Estimate of calculated surplus (+) or deficit (-) for the year 1950-51.			
Total income in basic year \times index of costs			
1. $\frac{100}{1,371.1 \times 299.74}$	= "requisite total income"		
$\frac{100}{1,371.1 \times 299.74}$	= 3,150		
2. $\frac{100}{3,186.5 - 3,150}$	= calculated surplus or deficit		
$\frac{100}{3,186.5 - 3,150}$	= +36.5 (surplus)		

million kronor. This surplus demands no action, as it was determined at the final readjustment of the calculation for that year which is now at an end. Nor would a reduction of prices have been necessary if the surplus had occurred in the adjusted calculation for the same production year during the autumn of 1949, as the surplus is within the four percent limit.

*IV. Typical Farm Calculation—A New Basis of Price Regulation
in Agriculture*

It has long been clear that there are defects in the total calculation, which means that it cannot be used indefinitely as the sole basis of price fixing. It should further be noted that the calculation becomes all the more cumbersome, the longer the time that has elapsed since the base year. The 1942 Agricultural Committee,³ however, in the course of their extensive investigations, drew up the principles for a new method, the typical farm calculation. The results of their very full enquiry have not yet been published.⁴

The purpose of the typical farm calculation is to enable progressive estimates to be made of the development of the economic results in such a way that the prices may be estimated of farming produce (and requisites) necessary to attain full profitability on rationally managed farms in a certain size group—the so-called typical farms. (In the investigations made by the agricultural committee the expressions “standard farm” and “basic farm” are used. The standard farms may be said to be farms that for Swedish conditions are ideal to work and support a family. They are, however, so few in number that price regulation cannot yet be based on the results obtained from them. Basic farms, on the other hand, comprise all farms of 25 to 50 acres of arable land. Typical farms are rationalized farms within this group, and it is on them that profitability estimates would be based.)

As regards the actual method of estimating, the calculation is to be based on the accounts from typical farms during normal years. This must be the starting point, in order to be able to forecast their profitability in different districts long before the accounts of the period of forecast are known. To make this possible, the quantities of different kinds of produce and means of production have been estimated on the basis of the accounts during a normal accounting year (1939–40). Once the normal quantities are known, calculations showing the changes in profitability for varying price levels of different produce and means of production can be very rapidly made for typical farms in different districts. In the same way, the effect of a certain percentage change in output, which may of course also be of interest, can be rapidly calculated. As the estimates are particularly made for typical farms in five large divisions of the country, the calculations show how a certain change in prices affects different areas. It is thus possible, when regulating prices, to take into account the farming conditions in different parts of the country, and prices can be so regulated as to give a fairly equal profitability in different districts in spite of varying conditions.

³ A special committee appointed in 1942 for the purpose of framing principles for the future agricultural policy in Sweden.

⁴ A. H. Stensgård and Sven Holmström: *Investigation Into Methods of Calculating Prices That Provide Full Profitability For Farming at a Certain Stage of Rationalization.*

The typical farm calculations, of course, show only the profitability of the group of farms that the calculation has in view. It should be further pointed out that the typical farm calculation shows only the mean profitability in the group ("the average farm"). There are always large variations around the average. It cannot therefore be expected that the results obtained will agree with the results of all farms in the group. It must also be noted that the farms covered by the typical farm calculation shall be "rationally managed" farms in the basic group of farms.

The profitability of typical farms can on an average be expected to be less than that of larger farms, but greater than that of smaller farms. Small farms, where the conditions of production are less favorable, should, according to a proposition approved by Parliament, be amalgamated into larger units—but only by agreement with the owners.

V. Summary of Distinctions Between the Two Systems

The essential difference between the two systems is that the total calculation considers the whole of Swedish agriculture as one concern, while the typical farm calculation considers the results of a certain group of farms.

Thus the total calculation is an attempt to determine the trend of the total income and costs of agriculture. A comparison is made of the developments in income and costs from a basic year (the production year 1938-39). On the basis of the total calculation, an attempt is then made to regulate the prices of agricultural products and requisites so that agriculture as a unit should be covered for the rise in costs that has taken place since the base year. In other words: the purpose of that kind of price regulation is to preserve an equilibrium between the development of total income and costs (for agriculture as a whole). It should be noted that the total calculation makes no pronouncement regarding the absolute profitability of agriculture. The calculation is merely an instrument by which price regulation can maintain the *relative profitability* of agriculture unchanged in comparison with the base year 1938-39.

The typical farm calculation, on the other hand, is not intended only to show the trend of income and costs compared with a basic year. It is also meant to show the profitability of agriculture on a certain type of farm, the typical farm.

DOMESTIC CONTROL OF AN EXPORT INDUSTRY: CUBAN SUGAR

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ARTIFICIAL control of the world sugar market has been more widely studied than the regulation of the sugar industry within the leading exporting country.¹ Yet, from many points of view, Cuba offers an extremely significant case history. It enjoyed, particularly in the two decades after 1905, a spectacular period of economic development. After some intervening years of adversity, the island can today claim one of the highest per capita incomes in Latin America, exceeded only in Argentina, Uruguay, and Venezuela.² Cuba's economic advance has come not by stress on heavy industry, which has so much appeal abroad, but by an equally orthodox method—emphasis, perhaps overemphasis, on production for export. Both the advantages and the disadvantages of choosing that alternative are sharply revealed by Cuba's experience.

Moreover, something like a "Point Four" program has been applied to that country since 1899. Agencies of the United States Government have cooperated with Cuban officials in the fields of health, education, roads, industrial development, and agricultural research. Private capital accompanied technical aid. American business enterprises have in the past been willing to invest hundreds of millions of dollars in sugar mills, railroads, power, and communications. Technical assistance to distant areas like Southeast Asia may be improved if we understand more clearly the effects of such programs closer to home. The comparison is particularly relevant because Cuba has coped, not unsuccessfully, with the foreign-dominated plantation system, the future of which is so cloudy in the new nations of Asia. While a variety of devices have been used, nationalization has not been one of them. Private business enterprise has adjusted to a pronounced change in the "rules of the game." As yet no important American company that entered Cuba with a view to producing and exporting raw sugar has seen fit to cease operations, despite bankruptcy proceedings for some in the severe depression of the early thirties.

The twenties had been a period of considerable experimentation in and debate over sugar marketing policy. The issue of controls vs. laissez-faire remained very much unsettled, and procedures varied widely between

* The author has had the benefit of criticisms and suggestions from J. S. Davis and V. P. Timoshenko.

¹ An exception is Ramiro Guerra y Sanchez, *La industria azucarera de Cuba* (Habana, 1940). This source has been used for details of some of the earlier legislation.

² United Nations, Statistical Office, *National and Per Capita Incomes in Seventy Countries—1949* (New York, 1950), p. 28.

total freedom of transactions and completely centralized selling.³ No such doubts were to be entertained during the thirties. The official average (*promedio*) price of sugar in public warehouse, Cuban ports, remained below 1.5 cents per pound throughout most of that decade. The crop, which had exceeded five million long Spanish tons in 1925 and again in 1929, was below two million in 1933 and had temporarily revived to only 3½ million in 1937. In so adverse an environment, through revolution at home and war abroad, the export of sugar from Cuba has been regulated by government continuously since the Sugar Stabilization Law went into force on November 15, 1930.

Of particular interest here is the system of domestic controls that emerged with the dual purpose of changing the internal structure of the industry and redistributing reduced sugar revenues among the various claimants. The pattern cannot be fully understood unless one distinguishes a number of problems, not entirely independent, with which public policy has sought to deal.

(1) The larger American-owned sugar mills (*centrals*) tended to become mere protrusions from the United States, incidentally resident in Cuba. Located frequently near the coast, served by their own sub-ports, operating self-contained railroad systems, importing directly most of their needs (including a labor supply), shipping sugar directly abroad, making only modest contributions to tax revenues, and disbursing dividends to non-resident stockholders, many mills were in no sense integrated with the Cuban economy. Multiplication or growth of such separate cells was a process quite different from development of the national economic organism.

(2) Although immigration into Cuba had been narrowly restricted as a preliminary to the 1902 Reciprocity Treaty with the United States, enforcement was lax. The new sugar companies in Oriente and Camaguey depended largely on cheap Negro labor imported from Haiti and Jamaica, of whom 250,000 were brought in between 1912 and 1925.⁴ The practice supported the expansion of "administration" cane, grown by the mill on a plantation basis in a manner centuries-old elsewhere in the Caribbean area. Consequently, independent *colonos*, cane growers who sold their product to the mills, were placed in a more precarious position. Continuation of the practice undermined the wage level of all labor, whether in the sugar industry or elsewhere, immigrant and native alike.

(3) The nature of the raw commodity was such that the sugar mill had a strategic (monopsonistic) advantage when buying cane from growers in the

³ Cf. U. S. Tariff Com., *Economic Controls and Commercial Policy in Cuba* (1946), and B. C. Swerling, *International Control of Sugar 1918-41* (Food Research Institute, Commodity Policy Studies 7, Stanford, 1949), chap. v.

⁴ Ramiro Guerra y Sanchez, *Azúcar y población en las Antillas* (3d ed., Habana, 1944), p. 179. Much of the movement was seasonal.

area it served. Sugar cane is not storable; once harvested, it must be processed quickly into raw sugar. The *colono*, even if he owned his land, depended on the *central's* railroad system and grinding mills, frequently without alternative means of transportation or processing. Where he merely rented from the mill, as was typical in the leading sugar provinces, actual or potential competition from administration cane was the more immediate, and this fact was reflected in the lower price received for his sugar cane. The reciprocal dependence of the mill, which could not maintain high capacity operations without an ample and continuous flow of cane during the grinding season, was less serious in the days before growers and workers resorted to concerted action.

(4) After it became government policy to restrict the size of the crop, the *colono's* position was weaker still. The *central's* natural tendency was to grind the administration product first, since an investment in agricultural operations and perennial cane plant was otherwise lost. Secondarily favored was the cane of those *colonos* who would be liquidating, from proceeds of the sale, outstanding debts to the mill. The main burden of surplus cane would then be borne by strictly independent growers, particularly the very ones who resisted the pressure to overextend their borrowing.

(5) Under the adverse market conditions that developed in the late twenties, excess capacity in the form of mill grinding facilities paralleled surplus supplies of growing cane. Many mills were forced to cease or suspend operations.⁵ Reduction of the industry's productive capacity by unchecked competition seemed both undesirable and unequal. Each sugar mill formed the economic and social core of a rural community; when the industrial plant closed down, the entire area atrophied. Over-all reduction in the pace of activity seemed preferable to complete paralysis in particular areas. Besides, multiple-mill companies could adjust more readily than single-mill Cuban enterprises to lower levels of production. By halting operations entirely at particular factories, the former could hold their more efficient mills closer to low-cost, full-capacity operations.

In the lean years, moreover, it was the American-owned mills, with their easier access to finances and markets, that stood the better chance of surviving: such, for example, were Cunagua and Jaronú, supplying the American Sugar Refining Company's plants on the eastern seaboard; Boston and Preston, shipping to United Fruit Company's Revere refinery at Charlestown, Massachusetts; Delicias and Chaparra, associated with the Colonial refinery at Gramercy, Louisiana. After 1934, an assured position in the United States market meant not only larger sales volume but also higher prices, for the import-quota system then introduced held the price of raw sugar in New York consistently above the world market. The Cuban Gov-

⁵ In 1925, 183 sugar mills were active; in 1933, only 125. *Anuario azucarero de Cuba 1940* (Editora Mercantil Cubana, Habana), p. 90.

ernment was not prepared to tolerate a further expatriation, nor a higher degree of concentration, of ownership in the sugar industry.⁶

(6) Large landholdings have been an important feature of sugar cane production in Cuba. In 1949, 65 mills in the provinces of Oriente and Camaguey alone owned almost three million acres of land and controlled by lease or contract an additional one million acres.⁷ The entire cultivated area of Cuba was scarcely five million acres in 1945, more than half of it in cane.⁸ In sharp contrast to the larger properties, almost 10 percent of Cuban farmers are squatters (*precaristas*), lacking legal rights to the land they occupy.⁹ The Constitution of 1940 recognized the pressure for land reform by proscribing large holdings and anticipating restrictions on foreign ownership of land (Article 90). These provisions have not been implemented.

Solutions of certain of these problems were sought by measures not concerned exclusively with the sugar industry. (1) New private ports were prohibited by law, and traffic in those previously established was limited.¹⁰ While the immediate beneficiary of the law was the Consolidated Railroads of Cuba, public railroads (i.e., those not confined within private sugar properties) in some regions improved the competitive position of the cane grower by giving him the alternative of shipping to any one of several possible mills. A further purpose was to integrate more closely with the economy as a whole the import and export trade arising out of the sugar industry. The incidental increase in costs of sugar production seemed less important at a time when American tariff increases were offsetting Cuba's low-cost advantages. (2) A protective tariff policy was initiated in 1927. New domestic enterprises, a more diversified agriculture, and subsistence crops were expected to reduce the impact on the economy of the seasonal surge and sag of the sugar harvest (*zafra*). Besides, the working force dependent on the *centrals* would be fed more by a domestic food supply and less by imports.¹¹ (3) As an emergency measure, in 1933 a moratorium was placed on rural mortgages until June 1, 1935, covering all capital payments and interest charges in excess of two percent.¹² This interference with property rights

⁶ As late as 1939, Cuban nationals owned a mere one third of the sugar mills, responsible for only 22 percent of the sugar production. By 1949 they held 100 of the 161 mills, and supplied 45 percent of the output. The shift was due as much to naturalization of former Spanish owners as to purchase from foreign proprietors. Although American-owned mills' share of output declined (from 55 to 51 percent), their absolute production increased nearly 75 percent. *Ibid.*, p. 69.

⁷ *Ibid.*, p. 65. For the circumstances under which some of these properties were acquired, see L. H. Jenks, *Our Cuban Colony* (New York, 1928), especially pp. 33-35, 130-32.

⁸ Lowry Nelson, *Rural Cuba* (Univ. of Minnesota Press, Minneapolis, 1950), pp. 48-50, quoting from unpublished data of the National Agricultural Census, 1945.

⁹ *Ibid.*, p. 103.

¹⁰ Tarafa Law, Oct. 9, 1923.

¹¹ Mills and plantations were at times required to furnish surplus land rent-free to their employees for planting subsistence crops in the dead season. E.g., Sugar Coordination Law, Sept. 2, 1937, Art. XLVII. Under earlier lease practice, the *colono* had frequently been forbidden to plant minor crops at all, to preclude competition with cane.

¹² *Ley de Moratoria Hipotecaria*, May 3, 1933. Moratoria on agricultural credit were continued for several further periods, e.g., by the Sugar Coordination Law, Art. XXIII.

was the means of accomplishing, in a country where financial organization was ill-developed, a social purpose attained in the United States during the same period by a more orthodox method, government loans. (4) Since 1933, severe restrictions have been placed on immigration. Some devices, for example, the so-called "50% law," have sought to assure admission of Cuban nationals to all occupational categories.¹³

The basic control that applied specifically to sugar has been a system of quotas. Since 1930, the production of every mill, as well as the national total, has been apportioned among four categories: sugar destined for local consumption, export to the United States, export outside the United States (or "world free quota"), and certain special reserves. Marketing (mainly export) quotas issued accordingly to each mill serve to distribute among all sugar companies the advantages and disadvantages of the four categories of disposition.¹⁴

Between 1930 and 1943, not only were sales outlets apportioned in this way, but the total crop was restricted to specified figures. Individual production quotas, based largely on output in the preceding period, were allotted each mill. The inter-firm struggle for survival was thereby ended. At the same time, policy deliberately favored the smaller Cuban-owned mills. "Free" mills, those whose raw sugar quota was 60,000 bags (about 8,500 tons) or less in 1933, were distinguished from quota mills and were largely spared the restricted output imposed on the rest of the industry.¹⁵ Basic principles for assigning quotas in the six-year period ending December 31, 1941, reiterated this special treatment of the smaller mills.¹⁶ Similarly, when wages came to be regulated, minimum rates for employees in mills grinding less than 75,000 bags were set 10 percent below the standard figures.¹⁷

Regulation of the agricultural sector of sugar operations paralleled control of the industrial sector. To spread the burden of crop restriction, each cane grower received a "permanent grinding factor," which entitled him to have his cane ground in proportion to his share in the total grinding of a specified mill in 1937.¹⁸ This had the effect not only of assuring moderate sales to all *colonos* but of guaranteeing that the smaller mills would not lack

¹³ Foreign Policy Association, *Problems of the New Cuba* (New York, 1935), pp. 216-17.

¹⁴ Infrequently, as for some months after war broke out in Korea, the world price may rise above the U. S. price. Sales for local consumption have in recent years been kept low under price ceilings.

¹⁵ Decree No. 3278, Dec. 29, 1933. Earlier, the limit had been set at only 28,000 bags (annual production 1928-31). Law of Jan. 22, 1932.

¹⁶ Decree No. 522, Jan. 18, 1936. Basic quotas assumed a standard crop of 2,315,000 tons and depended mainly on a mill's previous maximum output (Art. I). If the figure was more favorable, the basic quota of a free mill which produced less than 60,000 bags in 1934 and 1935 was to be its higher output in these two years; if it exceeded 60,000 bags in either year, its basic quota was to be its average in these years (Art. II).

¹⁷ *Acuerdo* No. 50, National Minimum Wage Commission, Jan. 6, 1940.

¹⁸ Decree No. 3390, Dec. 19, 1936.

a cane supply. "Free" *colonos*, those who owned their land or rented from a third party, enjoyed special privileges in transferring cane from one mill to another.¹⁹

Such a cane-grinding quota was a significant property right, one that could be exercised only in connection with a particular plot of land. As additional protection, the *colono* was assured of permanent tenure so long as he met his rental payments and continued to fill his cane quota.²⁰ While this "right of permanency" gave the renter some of the attributes of ownership, insistence on cane production discouraged any shift toward a more diversified agriculture. Nor was a quota that specified a quantity of cane rather than the output of a designated acreage likely to encourage per-acre yields.

Cane quotas were manipulated so as to reduce the disparity of size within the *colono* group and to discourage plantation agriculture. Two categories of small growers (*pequeños colonos*) were recognized in the Sugar Coordination Law. Those whose cane amounted to less than 30,000 *arrobas* (of 25 pounds each) in 1937 were not to be restricted below their full 1937 figure. A minimum quota of 30,000 *arrobas* was set for *colonos* whose production had exceeded that figure, but whose grinding factor had not allowed them to mill that amount (Articles I, II). These quota privileges were to be provided out of reduced allotments for both larger *colonos* (quotas above 500,000 *arrobas*) and administration cane. Discouragement of the latter began with the first restricted crop in 1926. Lest the mills give priority to administration cane at the expense of *colonos*', the law had required the 10 percent restriction of that year to be applied equally to *colonos*' and administration crop.²¹ Typically, about 10 percent of the crop is still administration grown; three percent of the *colonos*, those producing more than 500,000 *arrobas*, supply another 40 percent; while two thirds of the *colonos*, selling less than 30,000 *arrobas* each, provide a mere 10 percent of all cane, from an average area of about nine acres.²²

Under crop restriction, with excess cane standing in the field and growers frequently tied to particular mills by law, the grower was in a particularly weak bargaining position when negotiating with the mill on price. The

¹⁹ Decree No. 3389, Dec. 19, 1936.

²⁰ Sugar Coordination Law, Art. XXVI. American agricultural policy provides an interesting analogy. Under the early AAA program, contracts with growers of tobacco—another commodity cultivated largely by tenant farmers—prohibited producers from reducing their number of tenants or sharecroppers below the 1933 figures. Distribution of deficiency and price-equalizing payments among these groups was also required. H. B. Rowe, *Tobacco Under the AAA* (Brookings Institution, Washington, 1935), p. 151. For effects of the program on land values, see B. U. Ratchford, "Federal Agricultural Policy in Relation to Tobacco," *Journal of Politics*, November 1949, XI, 670-74.

²¹ Verdeja Act, May 6, 1926, Art. II. Positive discrimination against administration cane in quota allotments appears to date from Decree No. 3278, Dec. 30, 1933.

²² Cuba, Ministerio de Agricultura, *Memoria azucarera 1940-1946* (1948), Introduccion. The extent of the plantation system is not fully reflected by these figures. Many of the larger *colonos* should more properly be classified as "administration," and many of the smaller are in effect share-croppers.

arrobaje (portion of 100 *arrobos* of raw sugar paid to *colonos*) came next to be controlled. When the mill's *rendimiento* (yield of raw sugar per 100 *arrobos* of cane) was between 12 and 13 percent, 47 percent of the sugar went to the *colono*. If the *rendimiento* was higher, the *colono* received only 46 percent; if lower, 48 percent.²³ The implication was that higher sugar yields result from improved mill technique rather than from a more scientific agriculture. One result was that the individual grower had no incentive to increase the sucrose content of his cane: he shared only in the average yield for all cane ground by the mill, and in any case the *colono's* share declined as sugar yields increased. Nevertheless, the legal *arrobaje* was of particular advantage to growers in the eastern end of the island, where mills were more isolated, competition for cane was less effective, and *colonos'* returns had typically been lower.

Financial arrangements between mill and grower covered credit and lease of land, as well as sale of cane. The debt moratoria previously mentioned stabilized the position of the *colono* in his debtor status; the right of permanency provided security of tenure. Besides, so long as restriction remained in force, rentals on sugar properties were regulated directly under terms of the Sugar Coordination Law.

After the overthrow of the Machado regime (August 1933), labor's claims for special treatment were pressed at least as vigorously as those of *colonos* and the smaller mills. As the largest single employee group, sugar workers benefited from a number of general labor laws: control of immigration, collective bargaining rights, workmen's compensation, health and maternity coverage, vacations with pay, the basic eight-hour day. As a consequence of the last named provision, the mills, which operated around the clock in season, had now to add a third shift.

Beginning with temporary legislation in 1934,²⁴ minimum wage rates were specified for the industry. Different patterns were applied to cutters and haulers of cane,²⁵ other agricultural labor,²⁶ and the various categories of industrial help in the mill itself.²⁷ There were piece-rate and daily-wage arrangements; minima were specified separately for the duration of the sugar harvest and for the dead season; and some were designated in monetary terms, while others were tied to the value of a specified quantity of sugar. But all shared the characteristic of incorporating a sliding-scale principle that reflected fluctuations in sugar prices and thereby provided flexibility in costs and incomes.

²³ Sugar Coordination Law, Art. XII. Sugar was valued at the official average price announced fortnightly by the Secretary of Agriculture. An additional 5 percent went to *colonos* who did not lease their land from the mill.

²⁴ Decree Law No. 727, Nov. 30, 1934.

²⁵ Sugar Coordination Law, Art. XXXV.

²⁶ *Ibid.*, Art. XXXVII.

²⁷ *Acuerdo* No. 50.

The complex controls already outlined were depression induced. The last crop subject to output restriction was that of 1943. Larger crops of subsequent years, sold at higher prices, have brought a considerable degree of prosperity to the island. The sugar crop had an estimated value of \$650 million in 1947, as contrasted with barely \$100 million in 1939. While the basic sugar control machinery has been changed in few respects, the entire philosophy has shifted from one of distributing sacrifices within the industry to that of apportioning the wartime and postwar gains.

Cane growers and more especially wage earners have continued to be the main beneficiaries. A succession of increases in minimum wages²⁸ culminated in 1947, when industrial wage rates were more than double 1941 levels. Daily rates for field labor, formerly 80 cents, had risen to \$2.88. Sliding-scale provisions were not allowed to apply downward when sugar prices passed their peak. Instead, minimum rates for 1947, the highest on record, were extended into 1948.²⁹ The same practice has been followed in subsequent years. Labor has also successfully claimed a share of the returns from improved mill efficiency. An extra six days' pay was awarded in 1950 as "excess production" (*sobre producción*) on the grounds that by increased productivity the mills had dispensed with that amount of labor time during the season.³⁰ Labor's most recent victory has been the union check-off. One percent of the payroll is to be turned over to the sugar unions.³¹ The sum will run to several million dollars, possibly too much for a young union organization to dispose of wisely.

The growers' chief gain has come as a by-product of Commodity Credit Corporation purchases of the entire Cuban crop during World War II and the immediate postwar period.³² *Colonos* suspected that mill owners were accepting a lower return for raw sugar, which would have to be shared with the growers, but were bargaining hard on the price for blackstrap molasses, which had customarily accrued exclusively to the mills' account. In 1945, the *colonos* won the right to receive 47 percent (later 50 percent) of the returns from molasses in excess of four cents per gallon.³³ To enforce the measure more easily, and in view of the extremely limited number of buyers in the molasses market, the Cuban Sugar Stabilization Institute has been authorized to act as exclusive seller of the entire output.

Two further measures increased the growers' share of the returns from the

²⁸ Particularly Decrees No. 100, Jan. 15, 1942, and No. 117, Jan. 17, 1945.

²⁹ Decree No. 4602, Dec. 30, 1947.

³⁰ Ministry of Labor Resolution No. 1931, Apr. 11, 1950.

³¹ Decree No. 65, Jan. 20, 1951, Part of the total goes to the "C.T.C.," the national labor federation. One planned expenditure reflects the key importance of U.S. sugar policy to the island's welfare. A small delegation is to be sent to the mainland to promote more favorable treatment for Cuba under Congressional extension of the Sugar Act of 1948, now pending.

³² For details, see E. B. Wilson, *Sugar and its Wartime Controls 1941-1947* (Statistical Press, New York, n.d.), Vol. I, chap. iv.

³³ Decree No. 3209, Oct. 15, 1945.

main product. The *arrobage* (portion of raw sugar paid to *colonos*) was raised to a flat 48 percent, as compared with a previous national average of about 47 percent.³⁴ The price element in sugar cane sales was also approached directly. For some years mills had settled with *colonos* on the basis of an official *promedio* calculated from sugar prices ruling during a current 15-day period. Prices during the harvest months tend to be seasonally low, however, and *colono* pressure has resulted in a new 10-months *promedio*.³⁵ During 1950, with the sharp midyear price rise in response to Korean developments, the 10-months average proved financially embarrassing to mills which had sold much or all their sugar at lower prices ruling earlier in the year. A compromise solution was reached.

Conclusions

The sugar control system has most conspicuously affected the domestic distribution of revenues from sugar. Higher wages and larger returns to the cane growers have served to broaden the economic base in terms of local buying power and market for imported and domestic produce. They have also tended to reduce the inequality of income distribution in Cuba. Substantial increases in taxes on sugar production³⁶ are a balancing element in a fiscal system which depends heavily on customs, excise, and consumption taxes. Statistics for three foodstuffs, staples obtained predominantly from abroad, provide a fair index to the wide distribution of the recent prosperity. In 1949 as compared with 1939, while the population increased about 23 percent,³⁷ the physical volume of imported rice was up one third; wheat flour, up 40 percent; and imports of lard more than doubled.³⁸ From this viewpoint it is not difficult to justify, in principle, the establishment of minimum wages for sugar workers, minimum prices for *colonos'* cane, or even *colonos'* participation in the profits from sale of molasses.

Other elements of the control machinery have had less desirable consequences. The "right of permanency" tends to freeze the existing pattern of land use. Cane quotas during the period of crop restriction discouraged higher per acre yields, development of new cane varieties, and greater use of fertilizer. A uniform *arrobage*, that did not reward higher sucrose content of cane, gave the *colono* little incentive to improve his raw product. If the

³⁴ Decree No. 2160, July 11, 1949.

³⁵ Decree No. 586, Feb. 6, 1948.

³⁶ A portion (up to 30 percent) of the dollar receipts from sugar and sirup sales has, since June 15, 1939, also been set aside to provide foreign exchange for Government needs and certain necessary imports. U. S. Tariff Com., *The Foreign Trade of Latin America*, Part II (Commercial Policies and Trade Relations of Individual Latin American Countries, Section 18: Cuba, 1940), pp. 25-26.

³⁷ United Nations, Statistical Office, *Monthly Bulletin of Statistics*, March 1951, V, 6.

³⁸ Data for 1939 are official Cuban statistics as reported by P. G. Minneman, in *The Agriculture of Cuba* (U. S. Dept. Agr., Foreign Agr. Bull. 2, 1942), p. 126; for 1949, Cuba, Ministerio de Hacienda, Dirección General de Estadística, *Comercio exterior 1948-1949* (1950), pp. 337, 344-45.

arboaje has the simultaneous effect of encouraging increased mill efficiency, progress in that direction will also be retarded if labor is to take (in the form of "excess production") most of, all, or more than the gains in productivity. At the same time, mechanization in field and factory has been hindered by restrictive labor laws, while flexibility of costs—an important element of elasticity in an industry dependent on export markets—is lost when wage rates follow a sliding scale up but not down. Even the redistribution effects have not been entirely salutary. Use of the machinery of government for this purpose has inevitably meant political favoritism and worse. Public policy now tends to be determined by open contest among associations of mill owners, *colonos*, and sugar workers, each financed by mandatory levies. Disputes between mills on the one hand, and growers or workers on the other, have in recent years brought official government "intervention" in certain sugar properties, a practice that undermines the existing system of management without substituting an alternative form of entrepreneurship.

But analysis of sugar politics in Cuba must not ignore background problems that are basically economic in character. Of these, the most important are a certain institutional bias in an export economy and the particular commodity aspects of sugar cane.

Stress on expansion of sugar exports has meant an extremely unbalanced development. Financial, marketing, and transport facilities have tended to be adapted almost exclusively to the export crop. Plantation economy has not nurtured active, independent, rural communities that might promote such services as roads and schools on a local basis, without waiting for initiative from Havana. Except in the immediate vicinity of the Capital, science and enterprise have not sufficiently been applied to crop production for the domestic market. The attractiveness of cane in good times, and the lack of alternatives in bad, provide part of the explanation. But it is also true that the domestic market has had little appeal for the larger sugar mills, which are the natural centers of applied science. Although they have lately promoted new export crops (such as henequen and peanuts), their practices in earlier years positively discouraged diversification.

By tariff protection, public markets, a central highway, cold storage plants, and more recently an agricultural and industrial credit bank, Cuba has attempted to overcome certain of these institutional deficiencies. Restrictions on administration cane, and protection and secure tenure for the smaller cane growers, were devices for promoting a more democratic structure in rural society. But policy has yet to come to grips with broader problems of land reform. Equally complex difficulties surround an industry that creates a large rural proletariat by requiring almost a half million agricultural workers during the sugar harvest, the vast majority migratory labor without satisfactory employment opportunities during the off-season.

In the competitive struggle with sugar beets, sugar cane operates under

certain serious natural disadvantages. It does not—as they do—depend upon advanced agricultural practices, raise yields of other crops, promote and fit into rotation systems, and consequently develop the individual diversified farm enterprise. Instead, it dominates the economic life of certain tropical islands. In some cases, as in Hawaii, where both land and labor are scarce, high output per man and per acre have been attained by mechanization and heavy use of commercial fertilizer. Elsewhere, where land was scarce and labor abundant, the industry survived by virtue of agricultural science and new cane varieties, e.g., in Java in years past. By contrast, abundant land has not been an unmixed blessing in Cuba, where it has nurtured a lethargic agriculture. Nor was there any strong urge to mechanize field operations so long as immigrant labor was available or output restricted. To the extent that the sugar control system reinforces these same tendencies, the social reforms of recent years rest on a weak economic base.

For Cuba remains dependent on export markets. Long-term contracts with the United Kingdom might reduce her vulnerability, provided that Cuba's position inside the U. S. quota system does not deteriorate. An international sugar agreement, for which negotiations have been proceeding for some months, is no substitute for sustained sugar sales. To justify such an agreement by calling upon the terms of the Havana Charter (Article 57b)—“... to provide ... a framework for ... measures ... designed to promote ... a shift of resources and man-power out of over-expanded industries into new and productive occupations ...”—is to exaggerate beyond all reason the mobility of resources and to underrate by an equal margin the complexity of economic development. Cuba lives and breathes by sugar. The island's well-being or adversity will remain an index to the health of the international trading system.

RELATIONS BETWEEN AGRICULTURAL PRICE POLICY AND MARKETING RESEARCH*

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I

AS A backwash of the "Brannan Plan," there again emerged active interest in the relative money costs of supporting farm returns by various methods. The money costs imputed to the direct payment method of supporting farm returns, as proposed by the Secretary for "perishables," are often contrasted with the money costs imputed to the purchase method. The opponents and proponents of the Brannan proposal have made widely differing assertions as to the magnitude of its money costs in relation to other procedures for supporting farm returns. Such assertions, especially as they pertain to "perishables," appear to be based more on intuitive grounds than on adequate economic analysis. Yet, the currently active interest in marketing research can contribute to a better understanding of the differential money costs for supporting farm returns by the purchase and direct payment methods.

This paper is mainly concerned with three points. First, there is the objective of deriving and outlining, in analytical but simple terms, the essential differences in the money costs imputed to the direct payment method and purchase method of supporting farm returns. Second, and as a significant aspect emerging from the analyses underlying the first objective, is a connecting link between marketing research and agricultural policy, areas which too often are considered independently. Third, and finally, we shall briefly note some issues that arise in the construction and evaluation of cost estimates of supporting farm returns by either the direct payment or purchase methods.

II

In two issues of *Farm Policy Forum* (March 1950 and May 1950), Geoffrey Shepherd presented examples of money cost differences between a purchase and a direct payment type of program. Shepherd's analyses, as far as we know, are the first published attempts to estimate cost comparisons of the two alternative methods of supporting farm returns. George Mehren at the University of California has made an empirical comparison of imputed money costs under the 1948 Act, the 1949 Act, and the Brannan Plan, with

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and retail level, respectively, for a particular farm product. The situation is graphically illustrated in Figure 1, where FF is the industry demand function at the farm level, RR is the industry demand function at the retail level, and M is the marketing margin between the farm and retail levels.

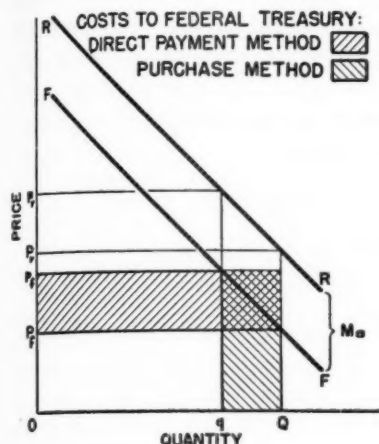


FIG. 1

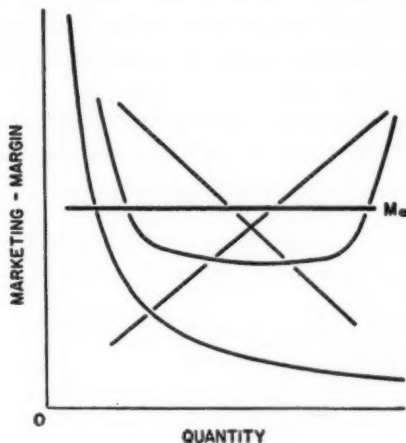


FIG. 2

It is noted that Figure 1 reflects a situation where the marketing margin per unit is invariant with respect to the quantity marketed; hence, when M is charted as an explicit function it is horizontal and is infinitely elastic. But that is a special case. The marketing margin function need not be invariant with respect to the quantity marketed. It may be infinitely elastic over its entire range, have a negative slope, have a positive slope, or include decreasing, constant, and increasing segments. Many possible forms may be assumed by the marketing margin function, and a few obvious ones are shown in Figure 2. Only marketing research can give an adequate basis for determining which type of marketing margin function is characteristic of the marketing costs for a particular crop marketed under specified conditions, and the functions may change over time or in response to variations in factors such as technology, market organization, and practice.

With the above comments on the characteristics of the marketing margin function as background, let us return to our objective of outlining the money costs incurred under two methods of supporting farm returns. We shall consider the purchase and direct payment methods, with cost imputations to the Federal Treasury and the consuming public purchasing at retail. At this stage, only initial and direct money costs will be considered; the impact of other costs will be noted later.

In Figure 1, the capital P 's and Q 's refer to price and quantity under a direct payment method, where prices are permitted to reflect the interaction

of free-market supply and demand, and the Government makes direct payments to the farmers for the difference between the support and market prices. The lower case p 's and q 's refer to the farm support price and the corresponding quantity marketed under a purchase method, where prices are supported by government purchases at the farm support level. The subscripts f and r refer to the farm and retail levels, respectively. Hence, the retail price equals the farm price plus the marketing margin; or $P_f + M = P_r$, and $p_f + M = p_r$.

Under a purchase method of supporting farm returns, the initial money costs may be indicated as follows (using Figure 1):

$$\text{Cost to Federal Treasury: } (Q - q)p_f = Qp_f - qp_f$$

$$\text{Cost to consumers: } q(p_f + M) = \frac{qp_f + qM}{}$$

$$\text{Total} = Qp_f + qM$$

The Federal Government purchases the volume $(Q - q)$ at the farm support price of p_f ; and consumers purchase the volume q at the retail price, which is equal to the farm support price plus the marketing margin, or $p_r = (p_f + M)$. The total initial money cost is equal to $Qp_f + qM$; the first term Qp_f reflecting total money returns to farmers, and the second term qM reflecting total marketing charges incurred.

Under a direct payment method, the initial money costs may be indicated as follows (again using Figure 1):

$$\text{Cost to Federal Treasury: } Q(p_f - P_f) = Qp_f - QP_f$$

$$\text{Cost to consumers: } Q(P_f + M) = \frac{QP_f + QM}{}$$

$$\text{Total} = Qp_f + QM$$

The initial and direct cost imputed to the Federal Treasury is equivalent to the total volume produced (and commercially marketed) valued at the difference between the farm support price and the free-market farm price corresponding to the quantity produced and marketed. Consumers initially bear a money cost reflecting the total volume produced and marketed, valued at the free-market farm price plus the unit marketing margin. The total money cost is equal to $Qp_f + QM$; the first term, Qp_f , reflecting total money returns to farmers, and the second term, QM , reflecting total marketing charges incurred.

In the above formulations, one can readily see that the total money returns to farmers, Qp_f , is the same under both the purchase and direct payment methods. Hence, the total money costs differ among the two methods only to the extent that the total marketing charges differ, or to the extent that there is a discrepancy between qM and QM .

The above formulations permit comparisons between money costs to the Treasury and the consuming public. From the view of imputing money

costs to the Federal Treasury, the analytical answer seems to be clear and straightforward, but only if we limit ourselves to the initial and direct costs to the Government. When the elasticity of demand with respect to price is less than unity at the pertinent quantity on the demand curve at the farm level, the initial cost to the Federal Treasury is less under the purchase method than under the direct payment method. If the coefficient of price-elasticity is equal to unity at the pertinent point on the demand curve at the farm level, the methods impose equivalent money costs to the Treasury. If the coefficient of price-elasticity is greater than unity, again at the pertinent quantity on the demand curve at the farm level, the cost to the Federal Treasury is greater under the purchase method than under the direct payment method.

The preceding statements on government costs reflect only direct costs. They do not include costs incurred by the Government in handling commodities acquired under the "purchase" program, or costs incurred in disbursing checks or making payments under the "direct payment" program. Furthermore, under the "purchase" program the initial money outlay by the Government may be offset, in part, or even cancelled by subsequent resale either at home or abroad. If the Government sells acquired stocks to domestic consumers, there results a credit to the government account and an offsetting debit to the consumer account. If the Government sells acquired stocks to foreign purchasers, the government account only is credited. Also, it may be noted that the government resale price may reflect physical losses incurred through spoilage and deterioration of stocks while held in storage. But the government resale price may also reflect changes occurring in market conditions between the date of acquiring the stocks and disposing of them. The types of indirect costs and returns to the Government mentioned here are not explicitly reflected in the preceding analysis, but their results can be easily modified for the inclusion of the indirect costs and returns to the Government. To obtain precise analytical indications, we need information on government handling cost functions and government payment cost functions, as well as the marketing margin functions considered above.

From the view of imputing money costs to the consuming public, the analytical answer is not at all clear. Such costs are of several types. There are initial and immediate costs reflected in the prices consumers pay and quantities they purchase; second, there is the incidence of taxation implicit in the treasury costs noted above; and third, there is the foregone consumption which may face the public if under the purchase method the Government does not redirect its stocks back into the markets. We shall now consider the first type of money costs, those with which consumers are faced initially and directly. In that manner, we can use the price-elasticity characteristics of the consuming public's demand curve. If the consuming

public's demand is inelastic at the pertinent quantity, the initial money cost to the consuming public is greater under the purchase method than under the direct payment method; if the retail price-elasticity coefficient is equal to unity, both methods reflect equal money costs to the consumers; and if the coefficient is greater than unity, the money cost to the consuming public is less under the purchase method than under the direct payment method.

One may question how the above results contrast with those based on "average" elasticity and marketing margin as used by Shepherd. Although his results flow from what may be considered only as examples, one may easily gather the implication that they are indicative of the actual situation. Yet, the fact that he uses some type of "average" marketing cost and a coefficient of price-elasticity that presumably reflects elasticity at the centroid suggests that his results are only a special case. They cannot be general for the commodities he considers, unless the marketing margin is invariant with respect to the quantity marketed and the price-elasticity he uses is appropriate for that quantity on the demand function at the farm level. Hence, our results are more general in the sense that they are not tied to an "average" marketing cost or "average" elasticity. Our formulation is sufficiently general so that the character and influence of the marketing margin function (with respect to the quantity marketed) can be clearly seen. This is of importance, since the form of the marketing margin function influences the difference in the money costs between the purchase and direct payment methods of supporting farm returns.

Although definitive information, supported by empirical studies, is not available, one may well question whether the form of the marketing margin function, for various farm products or even the same farm product over time, is such that it leads to an unequivocal conclusion concerning the relative money costs under the purchase and direct payment methods. What is clear, however, is that the two methods yield equal total initial money costs only if the marketing margin function is a rectangular hyperbola, so that the total marketing costs are invariant with respect to the quantity marketed. Hence, without knowledge of the marketing margin functions, one cannot make unequivocal statements concerning the relative total money costs of the purchase and direct payment methods.

To present the analysis in terms of real costs, in a sense of opportunity or foregone costs, would require a consideration of the problem on a different plane. Yet an analysis expressed in real terms may well be more significant and meaningful since resource allocation and use, as well as real income and its distribution, would be involved. On such a plane, however, the question of money costs differences between the purchase and direct payment methods would be less pertinent than the more significant question as to how supporting farm returns affects the real income level and distribution for the economy as a whole.

Although we do not here delve into a comparative analysis in terms of real income and real costs, we may note that under the direct payment method the consuming public is likely to receive a larger volume of goods than under the purchase method. That point is clearly brought out by Shepherd, and in Figure 1 is indicated by the difference between Q and q . The extent to which the public receives more goods, however, depends upon the disposition the Government makes of the supplies it buys under the purchase method. If the Government channels back into the supply-distribution system all of the stocks it purchased, and in the same form, the public receives the same volume and type of goods under the purchase and direct payment methods. With respect to "perishables" for which Secretary Brannan proposed use of the direct payment procedure, deterioration and loss generally occur while the stocks are held by the Government; and one may conjecture that the occurrence of such storage losses experienced by the Government, and widely publicized, is one of the reasons why the Secretary advanced the direct payment method for "perishables," but not for the "nonperishable" and "basic" crops.

While touching upon some points related to real income, it may be briefly noted that consumers will generally achieve from given expenditure budgets at least as much utility—usually greater utility—under the direct payment method as compared with the purchase method. Also, the taxation structure and incidence is likely to be different for the two methods. The differential tax structure can be expected to have impact on the consumer demand functions and result in shifts in consumption patterns. Hence, in a generally valid analysis, it is necessary to break away from a partial equilibrium approach and permit the demand and supply functions to shift in response to interactions generated by each method. For that reason, a later section emphasizes the limitations of and the need for freeing ourselves from partial equilibrium analysis in the consideration of cost comparisons as well as other agricultural price policy problems.

III

In the preceding section, we stressed the significance of the marketing margin function and its relations to evaluations of cost comparisons of two alternative methods of supporting farm returns. As with some other economic relations, the marketing margin function may in part be described by elasticity characteristics. The marketing margin elasticity (in the conventional form of price-elasticity), $(\partial q / \partial M) \times (M / q)$, may assume values less than, equal to, or greater than unity; and may be positive as well as negative. Its value and algebraic sign depend upon the equation reflecting the particular marketing margin function under consideration and the point at which the elasticity is measured. Total marketing costs may increase, remain constant, or decrease as the quantity marketed is varied slightly, the type of change depending upon the magnitude and algebraic

sign of the margin elasticity at the point under consideration. Such a concept of marketing margin elasticity is of some significance here because it helps to clarify the evaluation of total money costs involved in the support of farm returns, through a purchase method in contrast with a direct payment method. Also, it leads to a basis for analytically specifying the conditions under which the total money costs differ between the purchase and direct payment methods. Some differing situations and their relative effects may be summarized as follows, abstracting from indirect costs and returns to the Government:

Marketing margin elasticity at pertinent quantity marketed	Comparative total money costs for supporting farm returns at a specified support level
inelastic	purchase method > direct payment method
unit elasticity	purchase method = direct payment method
elastic	purchase method < direct payment method

Hence, there appears to be no unequivocal answer as to whether the total money costs must be larger or smaller for one method in comparison with the other. The magnitude of the marketing margin elasticity coefficient must be evaluated; and the appropriate point on the marketing margin function must be considered, since the elasticity coefficient may well vary in magnitude as the quantity marketed varies. Our conclusion as to the indeterminacy of the relative total money direct costs of the purchase and direct payment methods is reinforced when indirect costs and returns are considered. Government handling costs under the purchase method must also be compared with government payment costs under the direct payment method, using functions for handling and paying costs. Although it seems plausible that government handling costs would generally exceed costs incurred in making direct payments, the relation of such costs to the quantities handled by the Government, or for which it makes direct payment, must be known to reflect such indirect government costs in the analysis. In any event, we can conclude that no generally valid statement can be made as to the relative magnitudes of the total money costs incurred under the purchase and direct payment methods.

With the recognition that the nature of the marketing margin function influences the relative costs of the purchase and direct payment methods of supporting farm returns, we now have a direct interconnection between marketing research and agricultural price policy. Much too often those two areas of study have gone forward independently. For example, legislative and executive concern with agricultural price policy has usually been oriented to support levels and methods for attaining such levels; in the meantime, independent appropriations are made for marketing research, much of which is oriented to decreasing marketing margins and increasing

marketing efficiency. The Research and Marketing Act of 1946, as well as earlier federal support for marketing research, was instituted primarily aside from agricultural price policy problems. Yet, our analysis strongly suggests that much useful information to be learned from marketing research bears directly upon and should be incorporated into price policy and programs. The shape and position of marketing margin functions, and factors affecting their shifts, knowledge of which can only be accumulated through marketing research, definitely bear upon the evaluation of the relative costs of supporting farm prices by direct payments in contrast with purchases. That in itself indicates a contribution which marketing research can make to clearer discussion and formulation of price-support programs.

It is true that considerable research resources are being applied to studies of marketing costs. In fact, marketing margins and farm-wholesale-retail price spreads are among the most popular topics of marketing research in recent years. Yet those studies, in the main, are concerned with the estimation of some sort of "average" marketing costs. Examples include the Bureau of Agricultural Economics' program and its publications on price spreads for various products, as well as similar studies by various land-grant institutions and other groups. Although such studies and results are of interest and useful for some purposes, they do not provide information on the shape and position of the marketing margin function any more than do average prices, by themselves, provide information on the shape and position of a demand function. Yet margins such as are provided by the B.A.E. and similar studies should be useful, along with additional information, in the statistical estimation of marketing margin functions.

The usual marketing margins investigations may be construed as attempts to measure the marketing margin for some type of an "average" point on a marketing margin function, in order to ascertain the point's position at a given time and shifts over time. But for integrating marketing research and agricultural policy, along the lines sketched earlier, such "average" points are inadequate; what is required is the specification of the entire relevant net functional relationship between marketing margins and volume marketed, and knowledge concerning the variables which account for shifts in the net functional relationship which we refer to as the marketing margin function. To attain that goal, the current work in marketing margins must be oriented in the direction of econometric investigations, such as are in the vanguard of the work being done in statistical demand functions. Such a view becomes clearer when it is recognized that the marketing margin functions of the type of concern here are related to the demand for marketing services embodied in the transference of the commodity from the farm-producing industry to the retail trade. But the margins themselves do not measure the demand for marketing services; rather, the margins result from the interaction of the demand for and supply of marketing services.

Hence, in order to analyze the behavior of marketing margins and influences determining them, it is necessary to consider the demand and supply functions of marketing services.

IV

Investigators concerned with monetary comparisons of various types of programs, or procedural techniques such as the purchase and direct payment methods of affecting farm returns, may be tempted to use a partial equilibrium approach, where each agricultural product is dealt with in isolation under the well-known body of assumptions impounded in the phrase *ceteris paribus*. Such an approach by itself is acceptable only when a single product is under consideration, or when two or more products which are independent in both supply and demand are considered. But when the analysis is concerned with a group of farm products some of which are interrelated in either supply or demand, the *ceteris paribus* assumptions applied to each product in turn are valid only as an initial procedure which should be followed by adjustment for product interrelations. In other terms, when a group of products is under consideration, the total money cost pertinent to the products related in supply or demand cannot be correctly derived by simply summing the *ceteris paribus* results of the separate products. Competitive and complementary demand interrelations must be reflected in the analysis. And when supply is concerned, competitive and complementary interrelations, including joint supply, must also be reflected. Hence, knowledge concerning cross-elasticities, as well as simple elasticities, is necessary, because when there are demand or supply interrelations a simple summation of individual particular equilibrium and *ceteris paribus* "answers" does not yield a valid aggregate value for the group of products.

The elementary points noted in the preceding paragraph merit emphasis, since some current discussions imply, and certain investigations suggest, that those points are being neglected. Yet their neglect may give results which are incorrect and even misleading for policy and program formation. The points at issue were well emphasized by Marshall when he wrote: "... we begin by isolating the primary relations of supply, demand, and price in regard to a particular commodity. We reduce to inaction all other forces by the phrase 'other things being equal': we do not suppose that they are inert, but for the time we ignore their activity. . . . In the second stage more forces are released from the hypothetical slumber that have been imposed on them: changes in the conditions of demand for and supply of particular groups of commodities come into play; and their complex mutual interactions begin to be observed. Gradually the area of the dynamical problem becomes larger; the area covered by provisional assumptions becomes smaller; and at last is reached the great central problem of the Distribution of the National Dividend among a vast number of different

agents of production. Meanwhile, the dynamical principle of "Substitution" is seen ever at work, causing the demand for, and the supply of, any one set of agents of production to be influenced through indirect channels by the movements of demand and supply in relation to other agents, even though situated in far remote fields of industry."¹

Hence, when one uses the Marshallian particular equilibrium approach, it is clear that the answer for the whole cannot generally be ascertained by summing the incomplete "answers" for the respective parts which in reality are interrelated. This view is not only pertinent for the aggregation of "costs" of a number of individual farm products in the analysis of methods of supporting farm returns, but is equally pertinent to broader questions concerning price-income policies for agriculture and its relations with the economy at large.

In view of the relatively few products for which there are acceptable measures of, say, simple price-elasticity, and even much fewer products for which there are acceptable measures of cross-elasticities of price, it is obvious that empirically analytical evaluations of agricultural policies and alternative procedures for affecting farm returns can only be on shaky ground. For even to initiate the stage of analysis to which Marshall refers as "the second stage," it is necessary to have cross-elasticities among products so that "their complex mutual interactions [may be] observed." Here is an area that merits intensive empirical research in order to provide adequate bases for policy formation and program development. Yet, such studies should not be limited to single equation multiple regression analyses, especially those limited to single products. Rather, what is called for is a comprehensive and methodologically more appropriate procedure along the lines of the current path-breaking work in linear programming and structural estimation by sets of simultaneous equations. Such a research program, admittedly, requires the support of relatively substantial research resources. Might it not be worth-while, however, for an agency of the Federal Department of Agriculture to support and encourage a linear programming analysis of supply-demand interrelations among agricultural products and between major segments of agriculture and the rest of the economy? In terms of promising results useful for policy formulation and evaluation, such a program of research would well be worth-while.

V

Before summarizing the essential points in this paper, it is necessary to recognize a certain type of cost we have not explicitly included in the analysis. In the cost evaluations discussed above, the question of governmental administrative costs was considered only in a very general way. We need not

¹ Alfred Marshall. *Principles of Economics* (London, Eighth Edition, 1920), Preface to the Eighth Edition, pp. XIV-XV.

labor the point that administrative costs may be significantly greater for one method of supporting farm returns than for another method, and that recognition should be given to administrative costs in the evaluation of alternatives. But our analysis does conclude that, for a specified support level, there is no unequivocal answer that the direct payment method involves less, equal, or greater total money costs (aside from administration) than does the purchase method; and when government administrative costs are included, the conclusion is reinforced. The form of the marketing margin function, with respect to the quantity marketed, influences the results of the cost evaluations. Thus, marketing research on the nature and characteristics of marketing margin functions can contribute to agricultural price policy and program evaluation and reformulation, and at the same time serve as a link between marketing research and agricultural policies and programs. But in the research underlying the analyses of policies and programs which involve groups of products, appropriate methods of aggregation must be used in order to provide results which are valid and not misleading.

RESEARCH ATTITUDES IN FARM MANAGEMENT*

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A CONTINUING responsibility of farm economists is to review new contributions in the light of their potential usefulness in correcting deficiencies in the principles, methods, and concepts which constitute the science of farm management. Constant reappraisal is necessary to insure that research resources are used to the best effect and are not devoted merely to maintenance of the *status quo*, nor to the protection of an interest arising from a past contribution. The science of farm management has reached a period of critical review. Some of those engaged in this field appear to believe that too much of the work is misleading or fails to take account of some factors which influence the efficient use of resources on farms, and the farmers' response to economic change.

In any research program a balance of some kind must be struck between collection of current farm management data for use in extension work and the search for new relationships, new methods, and new concepts. These different phases of a research program imply differences in emphasis on the alternative methods of conducting research in farm management.

Reasons for Differences in Attitudes

So many influences impinge on the attitudes of farm economists toward research that uniformity of opinion as to purpose and method would in fact be more surprising than the differences which are evident. The differences depend in the main on the *purpose*, the *geographic location*, and the *background training* of the workers, each of which may be responsible for established tradition at different universities. Each of these influences alone is enough to create a characteristic attitude and adherence to a view which appears to be extreme to others with a different purpose, location, or training.

Purpose

The application of research results in extension work, the interpretation of problem situations by research workers, and the description of trends in

* This general review is prompted by the differences in attitudes toward farm management evident in various conferences attended by farm management workers. In particular, these differences have been apparent in the work of the North-Central Farm Management Research Committee and in the discussions presented at the Annual Conference of this Association in 1950 at Montreat. The purpose of this paper is to clarify issues, rather than to support or criticize any of the attitudes discussed.

This paper has benefited from the suggestions and criticisms of members of the Department of Agricultural Economics at the University of Illinois; and of J. Ackerman, R. N. Dixey, and W. P. Ranney. But responsibility for the viewpoint developed in the paper is that of the authors alone.

costs and techniques of production are all phases of farm management which can be distinguished. All have a related purpose, yet they may be found to be responsible for differences in method, for differences in ideas as to what constitutes a farm management problem, and for accompanying variations in the nature of the data collected.

First. The original inspiration for the development of farm management principles came from a group of men imbued with the desire to be of service to farm people and to make extension work more effective. The particular illustrations used in extension work as a basis for recommendations are generally formed by comparison of the operation and organization of farms whose operators have experienced varying degrees of success, as measured by income level or rate of return on investment. The relationships on which extension work is founded are in part derived from farm management research results, and in part from less systematic observation and experience.

Until the refinements in research method are perfected, however, the extension worker can only rely on his own judgment, on his own experience, and the research results which he can apply. His own role in the research program is to provide the research worker with a continual flow of problems which remain unanswered by the data and interpretations being supplied by research workers.

A *second* group of workers seeks relationships with scientific preciseness, guided by the theories of economics as the means of interpreting the problem and of forming hypotheses to be tested by empirical analysis. Their goal is to establish exact relationships capable of scientific proof by economic logic or by dependence on statistical inference. Once established, such relationships are of universal application in situations where the assumptions on which they depend are valid. This group depends on the extension worker to guide them to the gaps in present knowledge and to point out inadequacies in the flow of research data for use in extension work. But the formulation of problems and the definition of their scope in such terms that they can be resolved by the use of available research techniques are the responsibility of the research worker.

Third. Since the postwar adjustments which began in the late 1920's, farm management has expanded beyond the original goal of providing data for an extension service designed to aid individual farmers in increasing their profits. The experiences in adjustment work production goals and action programs have stimulated interest in regional and national aspects of farm production problems. Not all farm management research is designed for use by extension workers, nor is all of it directed toward particular problem situations which exist in practice or which are envisaged by the research worker. There is another area of problems, arising from production control and price support programs, which farm management workers have been called upon to help analyze. This is a legitimate field for farm manage-

ment research in view of the effect which production controls have upon the economics of production. "Freezing" production to farms and to areas tends to prevent the use of resources in accordance with the law of comparative advantage, as new techniques of production are introduced. In so far as farm programs interrupt responses to changes in cost and price relationships, so the need becomes great for continuing studies of trends in farm costs and income as affected by technological change in agricultural engineering, agronomy, and animal husbandry.

Applications of farm management data, for example, have been found in the determination of the relative credit status of different farming areas and different systems of farming; in the breakdown of national production goals on a regional basis; in the definition of labor requirements and standards of work necessary to justify draft exemptions in wartime; in data for land-use planning; and in studies of the equitability of differential freight rates and tax rates between regions and communities. The "routine" collection of facts is justified in serving these uses and others which cannot always be foreseen when the series of data are being planned. The importance of a continual flow of data from these "background" studies introduces a temptation to avoid a focus of interest and to fall back on the descriptive money cost analysis which has been the butt of much criticism, largely because of the limitations imposed by the assumptions on which the cost estimates depend.¹ Constant review of these descriptive studies is needed to insure that interpretations of the data recognize these assumptions and limitations. Yet such cost analyses, inapplicable as they may be to the short-term problems of the individual farmer, represent the best measure so far available of fluctuations in costs over time, especially when inputs are recorded in physical terms to which changing money values can be assigned. Extension workers also rely on these descriptive studies for background data and to assist them in placing problems in perspective.

Geographical Location

Differences in physical environment in which farm management research is conducted in various parts of the United States are reflected by differences in the attitudes of, and problems recognized by, research workers.

First. The importance of economic motives themselves varies among regions of the country. The limitations imposed by the environment on production opportunities and factors such as tenure, prevalence of part-time farming, capital rationing, and income level all vary among regions. The tendency to conduct research in terms of legal political unit boundaries leads to some duplication in neighboring states, and a corresponding opportunity to benefit from a regional approach to research problems. But

¹ E. J. Nesius, "Some Problems of Joint Use of Theory and Empirical Data in Farm Management Research," *this Journal*. Volume XXXII, No. 4, Part 2, November 1950.

the existence of major types-of-farming areas does imply different problems on which attention is concentrated in each area. Thus the effect on farm management of social factors and institutional rigidities will vary, and workers in one area find themselves faced with different relationships from those existing elsewhere.

Second. Areas differ in the *nature* of the economic problems existing in them. The western irrigation farmer's problem may be primarily that of water utilization; while the farm operator in the Northeastern States, a deficit grain-feed area, emphasizes dairy and poultry and the relationship of feed cost to product price. Operators in areas having a single crop or livestock production program are characteristically product-price minded, and pay particular attention to farm practices and size of the farm business. In the Western Plains area, weather risks are so important that they have received much attention in recent years. The highly diversified areas, especially the Middle West, offer alternative opportunities in terms of end products to be marketed; and relatively intensive production is economically feasible. In these areas input-output relationships and opportunity costs involved in production of different enterprises need to be compared. Farm planning has special application in this region where economic choices between enterprises have to be made. All farms operate in a constantly changing economic environment, but differences exist between systems of farming in the adjustments which can be made. Areas producing a single or a limited number of products have little opportunity to adjust production in accord with changes in short-term outlook, especially when seasonal weather conditions in any one year cannot be predicted. In highly diversified crop and livestock producing areas, farmers are afforded more opportunity to make adjustments in terms of the proportion of salable crops fed to livestock, intensity of feeding, length of the feeding period, and expansion and contraction of farm enterprises.

Third. Various states have taken up farm management research at different times and have pursued it with varying degrees of vigor. Basic cost data relating to production methods in use, variations in systems of farming, and factors associated with differences in income among farms generally have had first claim on research funds. In some cases problems being analyzed are more specific and perhaps less descriptive than those in states where work is limited to maintaining a continuous description of the changes in farming costs and methods.

Background Training.

There is evident in the work of farm economists a variation in the extent and in the nature of the economic training they have applied in their published work. The historical development of farm management is marked at different stages by the influence of economists who focused attention on the

relevance of economic doctrines to the particular problems of farm management. For example, prior to 1920, Taylor drew attention to economic principles which influence competition between enterprises, interpretations of cost analyses, and intensity of operation. In the twenties, Black's contribution was notable for his emphasis on methodology, input-output analysis, and the importance of comparative advantage. Marshallian price analysis was the theoretical foundation for the supply response studies of the twenties and later years. Institutional economics had its fling in the late twenties and found more practical expression in the agricultural programs of the thirties. Schultz and other economists have more recently drawn attention to the importance of uncertainty in the future on decisions and operations by economic firms.

The student trained in institutional economics finds it difficult to avoid emphasis on frictions and barriers to the operation of economic rules and principles; the Marshallian economist finds it difficult to avoid emphasis on the difference between the short- and long-term approaches, and the degree of fixity of farm resources and its effect on farm planning; the worker whose economic training was gleaned from trends and relationships as shown by statistics continues to analyze statistical data in search of new economic theories; and the more recently trained investigator believes it unrealistic, or at least inadequate, to ignore the influence of uncertainty on decisions made by farmers.

Research Methods Combine Alternative Attitudes

There emerge clear-cut differences in attitude toward farm management research which can be characterized in terms of the extent to which economic theory is used as a basis for the hypotheses employed to guide the collection of facts about farming. Economic principles may suggest hypotheses to be tested. Alternatively, an inductive research approach may be used to analyze data so as to reveal relationships; such analysis enables the problems to be comprehended, and the results to be used as indications of probable solutions. All gradations in view between the two poles exist, and some adhere more closely to one extreme than do others. In the thinking of those responsible for directions of research programs in general, there should be a merging of the different approaches rather than exclusive reliance on any one method.

The emphasis on fact collection is inherited from the physical sciences as they existed at the time when so many of the early workers in farm management began work; this stress was supported by the German historical approach to economic problems. It was the method on which the original framework of the science was built. Field work was designed to "get the facts," and hypotheses were withheld until data were analyzed to get findings from which principles were developed. The method relies on

statistical tools to reduce the mass of recorded data to manageable proportions. The theories of this group are formed after the search for relationships within the observed data. Such studies depend upon the collection of all the facts which might be thought relevant to a particular problem, and their subsequent sorting and analysis in search of relationships. In turn, any recorded relationships can be used to guide additional studies; hence later analyses can be more purposeful, concentrating on testing the empirical relationships for which some, but insufficient, evidence is provided in earlier studies. Variables which are susceptible to ready measurement—such as farm size, tenure, and farm equipment—receive emphasis in this method of research. These show clear-cut relationships in many instances. Yet such factors as tenure, size, and kind of equipment often make the transfer from one form of organization to another difficult for the farmer to achieve; and the means of transition to the desired reorganization requires special attention by the investigator. At this stage the analysis becomes less empirical and tends to rely on a more abstract form of analysis or alternatively on "practical common sense." The resistances to change are not always economic in character, and data available may not be appropriate to this kind of follow-up of the original study.

Having been practiced since the earliest days, this method of research is well established, particularly among those whose immediate interest is in conducting extension work among farmers. Its most useful purpose is to secure data which help farmers to recognize weaknesses in their farm organization. But the gross relationships which perforce must be presented by such analyses often hide the true determining variables. There are usually involved, to a greater or less degree, the problems of intercorrelations of factors studied with other variables not recognized in the analysis. Because of this, many of the commonly accepted rules and principles of good farm management are in fact unproved, or at least are not supported by statistically significant results. The problem is to some extent one of defining variables capable of precise measurement, but it also involves this problem of interrelationships between variables analyzed and those which are excluded from the analysis, in the hope that they will be among the "other things remaining equal." In any case, the individual farmer's problem remains unsolved by this kind of analysis, since he alone can modify the *general* recommendations to fit his *specific* problems.

An alternative research approach is to employ recent economic theories as guides to the interpretation of practical farm situations. This approach is particularly adapted to studies of production economics relating to the firm in which the multiple input-output relationships of many variables are emphasized. The law of variable proportions and the critical points at which resource combinations should be changed are the center of study. There is emphasis on flows of resources into, and of product from, the

firm; for this kind of analysis the indifference curve technique and concepts of isoquant and isocost curves are well suited, since they permit an easier grasp of many alternative resource combinations. Empirical estimation of these curves remains as a major practical difficulty. The use of economic theory as a guide to formation of hypotheses which may be used to interpret practical situations enables the research worker to take advantage of some of the logical implications of the work of the econometricians, especially in the sphere of model formation and statistical inference.

The logical implications of this method of analysis are twofold. First, the technique of consideration of many variables together directs emphasis away from cause and effect analysis characteristic of older farm management studies toward a concept of mutual or *simultaneous determination*. Endogenous variables do not *cause* changes in one another; they occur together at specified equilibrium levels which may be stable, unstable, or neutral. The second implication of this method is the emphasis on the problem of correspondence between reality and the measures of the variables used to describe it. The variables included in models are used to describe as closely as possible the actual system as it is conceived to exist. Models themselves may be poor guides to interpretation of true relationships, either because relationships represented in the model are unreal, or because the empirical data available do not fit the variables used to construct the model. This two-phased emphasis on the *meaning* of empirical data stresses relationships of the variable studied to other variables, and discourages any attempt to study one variable alone as the cause or dominant factor in the relationships being analyzed.

Examples of the Alternative Approaches

One example of ways in which the two methods may be used is afforded by studies of the managerial element in farming. Beginning in the late twenties, surveys were conducted to ascertain what personal characteristics farmers themselves, or field workers in extension, for example, thought were most necessary for success in practical farm management. A number of personal attributes were then listed; and, by grading farmers according to their rank, associations could be established by observation among different characteristics and varying degrees of success in farming as measured by income received. Little formal theory as to the nature of the managerial factor in farming guided these studies. Personal factors which were thought possibly to be important on the basis of experience and observation were analyzed, and this analysis was used as the guide in successive refinements toward a more precise description of attributes of successful farm managers. On the other hand, in recent years economic theorists have provided a promising framework on which a concept of the managerial element in farming can be based. This concept is based on a

division between technological skill on the one hand, and skill in adjusting operations to uncertainty on the other, and is associated with the problem of flexibility in the firm. The economic analysis provides a framework which can be used to guide collection of data relating to these entrepreneurial decisions of farmers, and it has aided greatly in clarifying problems associated with scale of operations.

Another example of the different approaches occurs in the use of outlook data. Those workers in farm management who have fostered the development of outlook reports since their emergence early in the twenties have done so because of their awareness of the importance of the dynamic nature of farming. Problems of change are central to the consideration of outlook information which, while it has been centered on probable price trends, takes account also of prospective changes in costs calculated from estimates of physical inputs. From these observations of price trends and changes in costs over some 30 years of work, comprehension can be obtained of the importance of the dynamic situation in which a farm is operated. Some 20 years after outlook work was started, a formal theoretical framework was used to interpret the individual firm's reactions to these problems of economic change. Economic analysis has since provided a theoretical framework which aids in explaining the differences in managerial skill and in attitudes among individual farmers in relation to uncertainty associated with the passing of time. It also contributes to the planning of research designed to establish the reasons for such differences, which have long been recognized by the extension worker, who was, however, left to his own devices to apply general guides provided by outlook data to the particular problems of individual farms. Economic decision making by individual farmers can be realistically interpreted only by recognizing the effects of uncertainty and risks in the farmer's operations. The attitude toward risk is in turn influenced by other institutional factors, some of which are economic in character. In individual farm analysis the emphasis is shifting toward evaluation of the opportunity to adjust operations and analysis of the resistances to those changes which farm management studies suggest to be desirable. This area of research is particularly suited to use of models as guides to empirical research. Recognition of more recent economic theories also involves attention to concepts of the flexibility of the farm firm, the function of management, and the importance of expectations.² Related to this emphasis on time is the problem of the life of farm assets as they affect farm costs, and the effects of overlapping amortization periods of farm assets on concepts of farm costs and on opportunities to change farm operations.

² E. O. Heady, "Application of Recent Economic Theory in Agricultural Production Economics," *this Journal*, Volume XXII, No. 4, Part 2, November 1950. G. L. Johnson, "Needed Developments in Economic Theory as Applied to Farm Management." *Ibid.*

Future Research Attitudes

The era of search for practical principles of farm management based on comparisons of groups of farms is passing. The 50 years since 1900 have been notable for the contribution of methods of collecting data and for the establishment of rules or principles of farm management. Although extension workers have dealt with individual farms since the inception of a national program of extension work in 1914, attention from the research viewpoint is now centering more on individual farm problems. That is, the reasons are being sought for observed differences, not so much among groups of farms, but rather between the group and the individual and among different individual farms. This change in the research approach is in part a result of the emphasis upon soil conservation and adjustment programs developed since 1933. This trend toward a more restricted approach to farm economic problems is represented by the emphasis on the management element, by the increased attention to dynamic economics, and to a less extent by the use of psychological concepts and individual preferences of farmers in analysis of decisions made by farm entrepreneurs. In addition, more attention is being given to *low-income* farms, *small* farms, *family* farms, *part-time* farms, and *beginning* farmers,³ leading to a more intensive study of more restricted problems. From a practical point of view, this concentration on more specific problems of somewhat limited scope is a desirable development, because farms on the same type of soil and possessing similar original characteristics and opportunities now have quite different potentialities due to the differences in management over the past century or longer. What is needed is to "nail down" the problem of *how much* of each resource to use, rather than merely to point to an increase or a decrease in the use of resources.⁴

The extension worker in the past has not been provided with many accurate guides to enable him to modify general relationships to fit individual farms, although in recent years considerable progress has been made in developing flexible standards for different farm situations. To a considerable degree extension workers have depended on their own experience, rather than on farm management research, for the application of the principles to individual farms. The need in the future is to close this gap between studies of groups of farms, on the one hand, and the application

³ Some examples of recent studies on these aspects of farm production include: S. E. Johnson and D. R. Rush, "Reorientation of Farm Management Research to Low-Income Farms," *this Journal*, Volume XXIII, No. 1, February 1941. W. W. Wilcox, "The Economy of Small Farms in Wisconsin," *this Journal*, Volume XXVIII, No. 2, May 1946. O. J. Scoville, "Measuring the Family Farm," *this Journal*, Volume XXIX, No. 2, May 1947. K. L. Bachman, J. C. Ellickson, W. D. Goodsell, R. Hurley, "Appraisal of the Economic Classification of Farms," *this Journal*, Volume XXX, No. 4, November 1948. G. A. Pond and W. L. Cavert, "How Long Does It Take to Pay for a Farm Starting with Heavy Debts?" *this Journal*, Volume XXVI, No. 4, November 1944.

⁴ E. O. Heady, "Production Functions from a Random Sample of Farms," *this Journal*, Volume XXVIII, No. 4, November 1946.

of the results of these studies to individual farm problems, on the other hand. These physical performance data can provide *guides* to expected performance under different organizations. They do not explain the *resistances* within individual farms to the changes which analysis may suggest to be desirable. These resistances are the particular point of interest for the workers whose task it is to introduce a program of action among farmers.

This stress on individual farm problems also involves a shift in emphasis away from descriptions of existing associations toward an interpretation of likely responses to alterations in input levels; it also necessitates an interpretation of reactions of individual farmers to recommendations based on rules of management established by analysis of group results. The flow of data to provide up-to-date support of farm management principles needs similarly to be recast. These principles should be subjected to constant critical review, rather than being merely maintained by continuous collection of data designed to reiterate accepted relationships. Only by imposing this attitude of critical reappraisal can progress in development of new principles and new solutions for individual farm problems be made.

Related to this trend is the problem of farm classification, which thus far has been largely based upon systems of farming and sizes of farms. Flexibility, cost structure, and uncertainty status of the farmer may serve as bases for the economic classification of farms. More attention to differences in opportunities for change among farms and among farmers may be a fruitful line of research. The land-use capability classification and soil classes have cut across the older classification of soils according to parent rock material, texture, and depth. Perhaps for some farm management analyses a meaningful and helpful classification of farms could be established on the basis of the adjustment potentialities of each farm.⁵ The classification of farms according to systems of farming has been inherited from the physical production sciences, for whose purposes it is well suited. But an economic classification should reflect more precisely the economic characteristics of farms. The practical difficulties in such a change would be very great, since the tradition of work in this field has concentrated attention on the physical characteristics of farms. The evolution of a farm organization in terms of an "agricultural ladder" for farms as well as for farmers may be a concept which can be developed in this context.⁶ A farm may adopt alternative paths of progress, some of which are dead ends, from the undeveloped farm operated on borrowed capital to the farm financed by equities and organized to produce at the maximum physical level possible under existing technology. Such reorientation as this may serve to point up common features among physically different farms. Perhaps the dif-

⁵ W. W. Wilcox, S. E. Johnson, S. W. Warren, *Farm Management Research 1940-41*, Social Science Research Council Bulletin 52, p. 47-49.

⁶ A. A. Alchian, "Uncertainty, Evolution, and Economic Theory," *Journal of Political Economy*, Volume LVIII, No. 3, June 1950.

ferences in managerial ability and psychological attitudes of the farmer and his employees should also receive more attention. The scope of farm management can then be expanded beyond the limitations imposed by the assumption that motivations are based only on economic gain, and workers can take account of the effects of the individual farmers' different managerial skill, managerial objectives, and resources.

Conclusion

Differences in attitudes toward farm management research may be attributed in part to the influence of the environment in which farm management workers operate, the teachers who guided their early work, their age and experience in dealing with practical farm decisions, and the mathematical and economic background which they possess. Workers in Land Grant Colleges have pressing responsibilities to meet the requirements of extension work, in terms of up-to-date facts to illustrate the established principles on which current extension programs must depend as they seek to serve individual farmers. The endowed institutions are less concerned with this responsibility. The policy worker is more concerned with the interpretation of a running record of changes and the best means of meeting the *ad hoc* problems which arise. Not all workers can pause to sharpen research tools, nor can any be excused from the responsibility of recognizing recent advances, and of passing judgment on the relevance of these advances to their own particular problems. In view of all of these different attitudes, a reconciliation of views may not be altogether desirable. Rather, the different research procedures need to be balanced in proportions best suited to the problem, and in the light of progress already made. Research on a regional basis should encourage exchange of views and more detailed discussions of alternative methods of analyzing situations common to several states.

There is available at present a wide range of research procedures, a formal framework of economic theory, and a body of facts relating to farm management which impose on all workers a responsibility to understand the possibilities and limitations of these procedures and to adopt more purposeful and specific analyses than have been possible in the past.⁷ Anticipation of future needs for research data by visualizing *future* problems can also increase the usefulness of research. This may also imply a narrowing of the scope of problems analyzed in any one study.

A useful test of the purposefulness of any project is to imagine at the outset what benefits would accrue if the highest hopes of the research worker were to be realized and the project were imagined to be a complete "success." What progress could then be made toward the understanding

⁷ W. W. Wilcox, "Research in Economics of Farm Production," *this Journal*, Volume XXIX, No. 3, August 1947.

of relationships or the extension of advice to farmers? Would the results merely support established practices, or would they expand the area of knowledge? Is the support of the previously known relationships needed, in the area concerned, and at this time? Could the funds be more effectively used elsewhere? What are the purpose and importance of the problem solution being sought? The research worker should not allow the difficult means of solution to obscure the objective estimation of the importance of the research project goal. Somehow such questions as these must be resolved to enable a balance to be struck between alternative research methods. This balance must be obtained either by conscious planning or sought by haphazard additions to an existing framework of research projects. While constant change in projects is unsettling and impractical, there is nevertheless a responsibility to review the new opportunities which advances in theory create, to ascertain whether the techniques or hypotheses suggested can be used to improve the existing program of research.

It behooves institutions such as Land Grant Colleges to strike a middle path, leaving the individual workers within them to develop their own perspective. Human nature appears to be such that these perspectives necessarily must be extreme in some cases if individual initiative is to be allowed free rein to search for the most fruitful results. Past research accomplishments should be acknowledged, while weaknesses should also be set forth. Individuals need to be open-minded in accepting new findings as promptly as their worth can be established. Theories regarding farm management need to be used by research workers in such a way as to provide extension workers with factual answers to their problems. These answers, while obtained by research based on economic theories, need to be expressed in terms which are both meaningful and convincing to the farmer. There should also be a place in any fully developed research program for those who seek new concepts or new empirical relationships. Such encouragement is needed especially in the early stages of work when the applications cannot easily be foreseen. Many major contributions of the past took a decade or more to reach full fruition. A similar space of time should be allowed those who now seek to contribute to progress by instituting changes in the collection, analysis, or interpretation of farm management data.

MAXIMIZING WORKER PRODUCTIVITY THROUGH EVALUATION OF ITS COMPONENTS—A HYPOTHESIS

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EVEN though it has been generally accepted that one of the primary objectives of research in marketing and farm management is to increase efficiencies in the physical handling and processing of goods, we have been particularly slow in developing suitable research techniques for attacking the problem. Let us examine these techniques in their present state of development.

Present Research Techniques

The conventional way the problem has been approached by economists consists of making descriptive studies in which the costs of alternative methods are compared. The approach has been one of seeking out some of the most efficient methods already in use, describing them and comparing them with less effective procedures, so that others may adopt them. The economist has quite properly taken delight in doing this, and without question many physical operating efficiencies have resulted; but we must recognize that the technique is limited to facilitating the exchange of ideas and practices already existent. Of course, in many cases descriptive research has served to pinpoint problems of inefficiency, thereby enabling farmers and marketing agencies to concentrate their efforts toward solving their real problems.

Although descriptive and comparative cost studies tell us that one operating procedure is superior to another, they have been limited in utility both because they fail to describe adequately the details of physical operating method so that others can apply it, and because they do not explain the basic reasons *why* one operating procedure is superior to another. In order to describe method and measure costs accurately, we find researchers in both marketing and farm management becoming interested in tools of analysis which have been developed in other subject matter fields. Among the more popular such tools are motion and time study.

This technique aids the economist in breaking work down into fine steps and serves the purpose of refining both description and comparative cost analysis. But the methods of motion and time study do not enable the researcher to determine why one worker is able to accomplish more work than another. It is with this problem and its implications that this paper is concerned.

Much of the research of industrial engineers and psychologists, as well as that of economists, has been directed toward problems involved in

maximizing worker productivity under given levels of human energy expenditure. Studies in all these fields have revealed wide variability in the physical productivity of both individual workers and methods of work. The economist has often had the feeling that the wide differences in costs found between firms or even between specific operations were the product of error in measurement; and fearful of criticism, he has been reluctant to publish anything but averages. While it may be true that error in measurement does exist, it is the wide variability in costs which often indicates fertile areas for research in physical operating efficiency. But differences in cost must be explained if remedies are to be found. In many cases, efforts to explain the fundamental reasons for such variability among workers have been restricted because of an inability to segregate and measure the individual influences of method, skill, and effort. In a given environment it is the product of these three elements that determines individual worker productivity.

Definitions of Components

As a component of worker productivity, method is defined as the particular combination of motions which has been selected for the performance of a specific piece of work. Effort is defined as the product of an exertion which entails movement. More specifically, effort is the product of speed times force. In specific work motions, where the weight of object handled (force) is a relatively constant factor, variations in effort are indicated by variations in the speed of the movement. Skill is the sum of all forces, other than method and effort, which influence the individual worker's productivity—a residual. It is not a homogeneous characteristic, since it has both a physical and a mental element. Physically, it is the minute differences in method which are due to the individual's muscular control (dexterity) in performing the movements. Mentally, it is the individual's ability to decide what course of action to follow. In so far as work performance is concerned, the most important aspect of skill is that it is the human characteristic which sets the limit to which the individual can go in applying effort without changing method. As the individual's skill grows, he can also increase the speed (effort) used in performing the motions involved in method. Within the limit set by skill, effort may be varied instantaneously at the will of the operator. On the other hand, skill can be increased only by training and practice over relatively long periods of time.

Need for Identifying Components

Isolating and evaluating these three components would enable the industrial engineer to establish more equitable wage standards. It would enable the psychologist to determine aptitudes on the basis of individual

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skill and/or effort free from the influence of method, and it would greatly refine the research techniques of the economist in identifying the causal forces behind output differences in his comparative cost studies.

In the setting of wage standards, industrial engineers have long recognized the necessity of adjusting for worker differences due to the combined influence of skill and effort. For years, these adjustments were made by time-study specialists who estimated the rate of worker performance based on their personal conception of a norm. And even to the present time this technique with all its subjectiveness is the most commonly accepted practice. Recently, refinements in leveling procedures based on standard times to perform basic motions¹ have been developed by several groups of industrial engineers² but, in so far as it is possible to determine, these standards also are based on subjectively leveled data.

Aptitude tests designed by the industrial psychologist have been based on empirical findings which do not make it possible to determine the causal forces behind performance, thereby limiting the value of the tests. Furthermore, the measured results of such tests have in many cases included the effect of chance selection of method, which is not or should not be a consideration in industrial processes where method is prescribed. The industrial psychologist has long sought to identify the independent influence of skill and effort in order to refine his analyses.

Many comparative cost studies made by economists have implied that differences in output were due to work method, where in reality this may or may not have been true because of the influence of worker skill and/or effort. For example, the conclusion reached from such a study might be that Firm A has a lower unit cost for a given operation than Firm B, and that therefore the physical operating system described for Firm A is superior to the one used by Firm B. In all too many instances comparisons of this sort do not hold valid for many reasons. Differences associated with method or skill may emerge in the quality of product produced by the two firms; or still more troublesome, differences due to skill and/or effort rather than to the method followed may show in the output of workers. In other words, it is entirely conceivable that Firm B and not Firm A has the best operating procedure; and that what has been lacking is the research technique that will expose this fact. Some few economists have recognized this problem, and have attempted to use a subjective technique of leveling

¹ Basic motions, sometimes referred to as "therbligs," are defined subdivisions of a cycle of motions. Frank B. and Lillian M. Gilbreth, "Classifying the Elements of Work," *Journal of Management and Administration*, V. 8, No. 2, August, 1924, p. 151.

² Harold B. Maynard, G. J. Stegemerten, and John L. Schwab, *Methods—Time Measurement*, McGraw-Hill Book Company, Inc. 1948. Other systems have been developed by Western Electric, by R.C.A. engineers, and by A. B. Segur.

to eliminate worker differences which is similar to that employed by the industrial engineer in evaluating worker accomplishment.³

Preliminary Investigations in Methodology

The authors, in the process of investigating the adaptation of the motion and time study techniques of the industrial engineer to agricultural marketing operations, developed the hypothesis that the degree of skill and effort involved in carefully defined basic motions can be isolated and measured, thus making it possible to determine the individual influence on output of each of the three components of worker productivity.⁴ In connection with this work, a test was designed to measure the response of different basic motions to changes in effort. In order to do this, it was necessary to hold method constant. Workers were requested to work successively at three substantially different levels of effort (speed). At each different level of effort the average time value for each basic motion and the total cycle were computed from high-speed motion pictures of the work. It was noted that as effort was increased, the time required to perform the entire cycle decreased. However, when the average time values of the basic motions were examined, it was found that *reach* and *move* responded more to changes in effort than did the cycle, while *grasp* and *position* responded less. In fact, there was no definite response at all in the case of the motion *position*. Since *reach* definitely showed the greatest response to changes in effort of any basic motion used, it was concluded that *reach* is more nearly the product of effort alone than are the other basic motions. *Reach* might well then serve as a base in determining the degree of influence of effort on the other basic motions.

Reach has other characteristics which make it a desirable base. It is relatively free from the influence of size, weight, and shape of objects. It requires a relatively long time to perform, thus making it easy to obtain measurements with a minimum percentage of error. It is common to practically all types of work, with the result that it occurs in association with a maximum number of basic motions. Its value as a base is also enhanced by the fact that it commonly constitutes a relatively large proportion of the total work performance time.

³ The techniques of leveling used by the economist and industrial engineer are essentially the same, but are done for a different purpose. The economist's approach to method study has been one of attempting to select the most efficient method from those he has been able to observe in use among firms, while the engineer's customary approach has been directed toward innovating improved method by means of applying the principles of motion economy to operations within a given firm (which does not involve leveling) and toward establishing standards for a "fair day's work" (which involves leveling). The economist's approach is illustrated by L. J. Haverkamp and L. S. Hardin, *Simplifying Tomato Canning Factory Operations*, Purdue University Agricultural Experiment Station, Bul. 528, April, 1948.

⁴ Progress statement of Title II RMA Project c:392, *Effective Utilization of Farm Labor in Marketing Agricultural Products: Research Methodology*, Cornell University Agricultural Experiment Station, 1950.

Correlating the selected base (which represents the degree of effort) with each of the other basic motions provides a means of measuring the influence of effort on each of these motions. For example, *reach* can be correlated with *grasp* by using the average time values of *reach* at different levels of effort as the independent variable, and the average time values of *grasp* which occur at the same levels of effort as the dependent variable. In some preliminary tests the time values were taken at three different levels of effort per worker for each of seven workers. Computing the coefficient of determination (r^2) for these data provided a measure of the degree to which the variations in *grasp* were influenced by the same force which influenced the variations in *reach* (effort). In these preliminary tests the coefficient of determination for *grasp* was .49. Thus, there were 51 percent of the variations in *grasp* which were not accounted for by effort. Since method is held constant in check tests, it can be assumed that this 51 percent residual is accounted for by variations in skill, either in its physical or mental aspects.

There may be some question in this procedure because of the possible existence of unexplained error, but this is believed to be at a minimum, because correlations between different motions having a high degree of similarity as to physical content revealed a very high coefficient. For example, correlation of the time values for *reach* with the time values for *move* revealed a coefficient of determination of .93. As further evidence, the coefficient was also found to be .93 when *reach* was correlated with another but similar move. It was observed that as the degree of precision involved in the motion increased, the coefficient of determination for the time values for *reach* and such motions decreased. For example, the coefficient of determination for *reach* and *position* was .04, indicating that *position* is influenced principally by skill.

Obtaining reliable correlations requires a statistically adequate average time value for each of the basic motions. These average time values provide a set of standard times for basic motions used in agricultural marketing processes similar to those recently developed by several groups of industrial engineers, except that they are not adjusted by subjective leveling.

A Hypothetical Model

It may be assumed that basic research in this area can establish the average time values and correlations which will yield data as illustrated in Table I. Here Method I involves basic motions A, B, C, D, and E, while Method II involves the same motions except C, which has been eliminated, thus a different method has been created. It may also be assumed that the two methods are performed by different operators requiring different times to execute the basic motions (Column d). In this instance, Method II is actually more efficient than Method I because one motion has been elim-

inated. But because of the difference in the operator's skill and/or effort it required longer to perform Method II. This illustrates the source of a common error, previously mentioned, made in comparative cost studies.

Average time values required to perform basic motions are substituted in the two methods, in order to adjust for operator differences and thereby determine the relative advantage of one method over the other (Column e). In this instance the total time requirement for Method I is 115, while for Method II it is only 85. Thus, 35 percent more labor is required to perform the work when Method I is employed.

The product of the effort evaluations shown in Column c which would

TABLE I. HYPOTHETICAL ILLUSTRATION OF THE INFLUENCE OF METHOD, SKILL, AND EFFORT ON WORKER PRODUCTIVITY

Method (a)	Basic motions (b)	% influence of effort (c)	Actual time (d)	Average time value (e)	Proportion influenced by effort (f) = (c) × (e)	Proportion influenced by skill (g) = (e) - (f)
I	A	90	22	30	27	3
	B	80	32	40	32	8
	C	70	26	30	21	9
	D	50	10	10	5	5
	E	20	6	5	1	4
Total			96	115	87	28
II	A	90	38	30	27	3
	B	80	48	40	32	8
	D	50	10	10	5	5
	E	20	4	5	1	4
Total			100	85	66	19

be determined by correlation with *reach*, as previously described, and the average time values in Column e, indicates the proportion of the basic motions which is influenced by effort (Column f). The remaining proportion of the average time value is assignable to skill. The skill requirement of Method I is 28/115 or 24 percent; and of Method II, 19/85 or 22 percent, thus indicating a slight additional advantage of Method II over Method I.

Using these same data, the effort and skill ratings for the individual operators can be computed by the solution of simple simultaneous equations. It can thus be determined that the operator following Method I is exerting effort at the rate of 150 percent and skill at the rate of 75 percent of average.⁵ This is a simplified illustration, in that actual experience may well reveal minor variations in the degree of skill or effort exerted by an individual on different basic motions.

⁵ Let x = effort rating and y = skill rating then for basic motion A; $27/x + 3/y = 22$ and for basic motion B; $32/x + 8/y = 32$. Thus $x = 150$ and $y = 75$.

Applications

From evidence such as has been presented was established the hypothesis that basic motions can be classified according to degrees in which they are influenced by the forces of skill and of effort. This information, coupled with average time values for basic motions, can be used to isolate and determine the basic causes for differences in worker productivity, and will serve to (1) provide an objective technique for appraising alternative work methods both in terms of time and of skill requirements; (2) establish an objective means of classifying work procedures based on skill requirements; (3) classify individuals in terms of their skill.

The individual firm or farm manager is interested in evaluating the forces of worker productivity (method, skill, and effort) for quite practical reasons. Such diagnoses provide the basis for corrective action aimed accurately at the source of his problem. Deficiency in any one of these three fundamental forces calls for different corrective procedure.

Workers having a high level of skill and working at a high level of effort can still fail to produce satisfactorily where poor methods are used. A fact which is not fully appreciated is that an individual can exhibit high skill in doing a job the wrong way. The first phase in the solution of this problem is to select a sequence of basic motions for performing each operation, giving consideration to both the average performance time for these motions and the skill requirements. The skill requirements of the selected method⁶ must be in keeping with the skill classification of the workers who are to use it. The second phase of the problem is to put the method into practice.

The problems of introducing new methods or of correcting skill deficiencies may be very similar as to method of attack. Effective training is the answer, and this is impossible without a reasonable knowledge of the elements of skill involved. Some people intuitively recognize the difficulties of others in the skill elements of their work, making them more effective in worker training. Others who must engage in the teaching of workers may increase the effectiveness of their training methods by a careful study of the skill requirements of basic motions and the skill characteristics of different classes of workers. The more clearly one understands the causes of the difficulties which workers have in performing their work, the more likely he will be able to train them effectively.

When effort deficiencies are found to exist, correction is largely a matter

⁶ Methods improvement research has not been as popular among research workers in agriculture as its importance warrants, partly because of a common misconception of its objectives. The phrase "finding the best method" is an unfortunate choice, because one must eventually realize that he has no assurance that he will ever find the "best method" or that he would recognize it as such if he did find it. Assuming that methods which are found or created can be accurately evaluated, there is no assurance that a better method will not be found or created later. The objective of work in this field should be the improvement of method over what we now have. Probably the most important use of analyses such as are contemplated in this paper is the elimination of costly mistakes and deficiencies.

of increasing the will to work. A wide choice of procedures which have proved effective in motivating workers is open to the manager. Some of the most common of these are: incentive wage payment (payment in proportion to production), profit sharing schemes, improvement of personnel relations, the provision of better working conditions and many others.

Any search into the relationships among the basic motions will contribute toward a better understanding of the causal forces behind worker productivity. While it will require a tremendous amount of meticulously collected and carefully catalogued basic data in order to establish acceptable basic motion time standards as well as skill and effort classifications, work in this direction will progressively sharpen the research tools of all those concerned with maximizing worker productivity.

NOTES

A COMMENT ON PROFESSOR SCHULTZ' "FRAMEWORK FOR LAND ECONOMICS"*

MOST land economists have likely approached Professor Schultz' recent article with some trepidation, since the author has a reputation for dealing severely with the muddle-headed efforts of his colleagues. Even for the lambs led to slaughter, however, it is disappointing to conclude that the executioner has spent his lethal blows on the moldering carcasses of ideas long since worried to death. Professor Schultz has carefully demolished, in several variations, an idea which land economists accept, if at all, with serious reservations. He has passed over—but not ruled out—large areas in which land economists have probably done most of their important work. He has suggested that they pursue a line of research that, historically, has long been considered a part of land economics. The author appears confident that he has thus established a "framework" for land economics. Land economists are more likely to feel that his penetrating analysis is largely irrelevant.

The article, however, purports to deal with land economics, and, whether its victims are straw men or human beings, its tone is generally critical. Land economists are therefore driven to consider it seriously and to offer for the record a defense against its imputations. Such a task is the more difficult because it cannot always be confined to a discussion of the validity of economic propositions. Professor Schultz, in presenting one side of the argument, is obviously speaking for himself.¹ The views with which he disagrees are not so precisely identified.² The inference that he takes issue with ideas that can be attributed impartially to all land economics will almost certainly be disputed by most of them.³ Professor Schultz' argument, of course, is with Professor Schultz' conception of land economics, but, in the framework he has elected, it is appropriate to inquire whether he actually understands what land economists are thinking, saying, and doing. This is more than a question of the representation of others' ideas; Professor Schultz seems to have missed the point of an approach that, properly understood, can clarify some of the issues with which he frequently grapples.

* Theodore W. Schultz, "A Framework for Land Economics—The Long View," *this Journal*, Vol. XXXIII (May 1951), pp. 204-215.

¹ See his footnotes, 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, and 16.

² See his footnote 14.

³ The views of land economists, unfortunately, cannot be presented jointly by the rather considerable number of individuals involved, particularly since they often do not agree among themselves. These words are written by an individual who speaks only for himself. His opinions are based on his training and experience as a land economist and on his personal acquaintanceship with a score or more of land economists.

It is interesting, of course, to speculate on the reasons for addressing this article to land economics. The section describing the "retardation hypothesis," while presented seemingly as a digression from the main theme, probably explains some of the author's impatience with land economics. Professor Schultz, impressed with the problem of poverty in agriculture, has apparently concluded that the basic explanation for poverty can be found in the imperfections of the capital market. He seems to have concluded further that differences between one region and others can best be explained by differences in location relative to the industrial-urban centers of the various "locational matrices." Professor Schultz, it may be surmised, has gone to land economics literature in search of evidence bearing on his hypothesis. Finding none,⁴ he may have concluded that land economics has given no attention to a field of inquiry which he considers of major importance. Furthermore, he is unable to see in land economics any alternative hypothesis other than the idea that low farm incomes are often associated with poor land.⁵

At the outset, the article refers to the role of land as described by Quesnay and the Physiocrats, Ricardo, Malthus, Karl Marx, and Henry George. The author believes that this view of the importance of land in the scheme of things is overstated, and he announces his intention of assigning land a "less spectacular . . . rather passive, pedestrian role." This comes as no particular shock to the other land economists. It is hardly too much to say that in the past 50 years, they, like most economists, have come to recognize that any productive enterprise depends upon a good many agents of production, any of which may, under the proper circumstances, become the strategic factor. The word "land," when applied to a group of economists, is a convenient way to describe a community of interests rather than an indication that those economists base their judgments on the *Tableau Economique*.⁶

⁴ He seems to have overlooked a persistent, although not exclusive, interest in location and transportation as evidenced by the writings of von Thünen, Edgar M. Hoover, Jr., C. J. Friedrich (on Alfred Weber), W. H. Dean, Jr., and Erich Zimmermann. More specifically, he might be referred to Chapters 3 and 5 of the Ely-Wehrwein textbook and Chapters 5 and 12 of Renne's *Land Economics*.

⁵ How land economists would explain agricultural poverty in a given region is more properly the subject of a paper than a footnote in these comments. The most obvious point, of course, is that no single explanation would be attempted. It might be anticipated that a considered statement would acknowledge the importance of economic location, the availability of capital goods, and the state of technology. It would also recognize the influence of soil types and other physical characteristics of the land, including the extent to which resources have been depleted or conserved. It would certainly ascribe significance to land tenure, habitual techniques, and other institutional factors that land economists, at least, consider of economic significance. It would doubtless give more than passing attention to the aptitudes, education, and desires which so frequently distinguish human beings from "economic men."

⁶ The elementary textbooks in this field align themselves with the social sciences by acknowledging their ultimate interest in human beings. More specifically, the focal point of land economics is the "relation of population to land" and the "relations of man to man arising out of the relations of man to natural resources." Land economists recognize that farm land is only one of the many important natural resources known collectively as "land."

An economist who gives more than cursory attention to the institutions affecting economic life soon discovers the futility of arguing the relative importance of land, labor, and capital. Moreover, he will even doubt whether the agents functioning in the real world can be sorted neatly into three or more mutually exclusive categories. For certain purposes, such as the intellectual calisthenics prescribed for graduate students, land economists sometimes look for a distinction between "land" and "capital." They are quite prepared, however, to be told that Grand Coulee Dam (capital) is a relatively immovable, permanent, and non-reproducible object, while a tree (land) is not. They are aware of the categorical differences between a hoe and an acre of agricultural land, but may boggle at the idea that \$1,000 in currency is really the same thing as \$1,000 worth of tractor parts.

In short, land economists are not unduly obsessed with the notion that their particular interest—land—is necessarily more important than any other factor, and they have the usual doubts about the virtues of a forced distinction, however traditional, between "land" and "capital." Nevertheless, Professor Schultz takes land economists to task for overemphasizing the role of land, and he does so apparently out of a determination to prove that his particular interest—capital—is more important than the other factors.

Before proceeding with his principal theme, Professor Schultz briefly acknowledges that in certain areas—mentioning land tenure, the economics of soil conservation, and some aspects of land utilization—land economists have done some creditable work. This casual dismissal of a major part of the subject matter of land economics is more than an effort to get on with the main business as soon as possible. Professor Schultz is going to prove that land economists are wrong in maintaining that there is a relationship between the physical attributes of land and the living that farmers can make from it. For this purpose, it is convenient to pass over the fact that land economists are ordinarily accused of so great an interest in institutions as to be incapable of asserting such precise dogma. Ordinarily, it would seem reasonable to expect that their investigations into taxation, property rights, tenure status, location, transportation, public land management, agricultural credit, land policies, agricultural programs, demography, farm technology, and political economy have long ago convinced the neo-Physiocrats that there are other matters than soil types to consider.

In fact, there is probably no imputation better calculated to annoy a land economist than the suggestion that he tries to explain differences in economic productivity by some kind of Ricardian system of land classification. In the heat of rebuttal, he might even assert that the bulk of his efforts are spent in isolating and evaluating the other elements that affect land utilization. This does not mean, however, that he will ignore or

minimize the implications for agriculture of variations in soils, topography, precipitation, and climate. Professor Schultz, on the other hand, apparently feels that there is no point in trying to distinguish between good land and poor land. He concludes that: "Parcels of land are simply too heterogeneous in their physical attributes that matter in economic production [sic] to permit meaningful aggregation." This is not the first time that land classification procedures have been criticized.⁷ It is indeed rare, however, that anyone working in a science will question the usefulness of an attempt to classify the phenomena with which he works.

No one will argue the conclusion that a completely satisfactory definition of productivity grades has never been, and never will be, worked out. Professor Schultz is not alone in observing that agricultural land good for corn is not necessarily good for cranberries. He might also have pointed to the disconcerting effect of changes in technology. (Recently developed techniques of supplemental irrigation, for instance, make "poor" sandy soils produce phenomenal crops of potatoes.) Even when he digresses so far as to introduce economic values in discussing "natural and original differences," he does no more than point out that it is possible to pay too much for "good" land when underpriced "poor" land may be more of a bargain. One must concede the obvious. It is quite another matter, however, to leap from this recital of difficulties to the conclusion that land classification efforts have been utterly meaningless and should, in fact, never have been attempted.

It is certain that land economists differ as to the methods, criteria, and usefulness of land classification procedures as a tool for explaining or directing economic behavior. It is almost equally certain that they agree on the following points: (1) the physical attributes of land play a significant, not necessarily dominant, role in land utilization; (2) to analyze economic behavior involving land, it is mandatory upon scientists to seek meaningful criteria for the definition of physical categories; and (3) current land classification procedures offer at least a first approximation to the delineation of productivity grades.

Professor Schultz goes on to mention the hypothesis that less capable farmers "... gravitate to so-called poor farms consisting of 'poor' land, and conversely." This is the notion that the best farm land is usually occupied by the most intelligent and thrifty farmers, and it is, frankly, very old stuff. Professor Schultz' reasons for disagreement are approximately the same as those advanced by many generations of graduate stu-

⁷ The bulk of the criticism, originating largely among land economists, by the way, questions the criteria by which classifications are made and the conclusions that may be drawn from them. The implications of this criticism can easily be overestimated. In many cases, the real issues are not theory and method but such mundane matters as administrative budgets and research programs. Some of the disagreement among land economists, in other words, is in the nature of an intra-family argument which has no particular relevance in this connection.

dents who, under Professor B. H. Hibbard, regularly banished this bugaboo after it appeared for the first time in 1925.⁸

The author also challenges the idea that the supply of land from the viewpoint of an entrepreneur is any more fixed than the supply of capital goods. He does so by focusing attention on the long run in which no factors are fixed. This line of argument, sometimes attributed to Alfred Marshall,⁹ is revealing for certain comparisons. Of course, it begs the question of relative fixities during any period short of the infinite future. Land economists, ordinarily working in this shorter period, find some evidence to support the contention that land—as space—is often relatively more fixed than the supply of capital. A landownership map of Professor Schultz' home state of South Dakota, for instance, will show quarter-section lines still more or less intact, although the country was homesteaded more than 40 years ago. This can be interpreted to represent an institutional fixity of some significance. It is certainly not impossible for a farmer to expand his plant by acquiring more land, but he is likely to find it somewhat easier to buy an additional 40, 80, or 160 acres from a neighbor than it is to buy, say, 8.5 or 21.6 acres. He may therefore find it simpler to make minor adjustments in his operations by looking for an additional milk cow and expanding at the intensive margin. This is not to say that land is fixed and another factor is variable, but merely that one is often relatively more fixed than the other, even over fairly long periods.¹⁰

Professor Schultz also takes issue with another view that "... holds that 'poor' land necessarily pulls the returns for human effort down as a result of technical or institutional conditions." He might well have rested his case on a simple denial, since the word "necessarily" bulks large. College students and land economists quickly learn that a statement including such words as "always" and "perfectly" had best be marked "false" when it appears in an examination.¹¹ But the author proceeds to demonstrate his conclusions by a more circuitous route. The questionable statement, says Professor Schultz, is advanced in the erroneous belief that "... such lands require virtually a fixed quantity of inputs of human effort and the resulting inflexibility necessarily gives rise to low returns for the human effort used on such farms." Professor Schultz has taken a Brobdingnagian step here, leaving the Lilliputians far behind.

⁸ Henry C. Taylor, *Outlines of Agricultural Economics*, 1925, pp. 140 ff.

⁹ *Principles*, 8th Ed., Ch. V, Book V.

¹⁰ Land economists will not insist upon this as an invariable distinction. Witness the recognition of one- and two-mule farms in which crop acres are proportioned to the unit of work-stock. More generally, the family farm concept attaches some significance to the fixity of the unity of labor inputs.

¹¹ Professor Schultz' approach, like a true-false examination, makes a sharp distinction between right and wrong. The examinee is left in a quandary when he contemplates a statement that is "sometimes" or "frequently" or even "generally" true, yet is not "necessarily" so. The above statement, as it stands, is clearly "wrong," although there is a mass of empirical evidence to the contrary.

Land economists have sometimes found significance in such factors as taxation and mortgage indebtedness. Studies have shown that the burden of local government, as expressed in ad valorem property tax rates, is sometimes measurably higher in poor land areas than in better-endowed areas. Other studies have indicated a rather general tendency to under-value good land and overvalue poor land, both in tax assessments and in real estate transactions. These tendencies, although not universally operative, would appear to have an adverse effect on the returns to the users of poor land. On these grounds, it might be maintained that poor land sometimes tends to limit the returns to human effort through the operation of related institutional factors.

Professor Schultz, however, asserts that the hypothesis rests upon the assumption of inflexible proportions between labor and land inputs. The reader may guess that the author may have been thinking of empirical studies of rural poverty which have found a lack of alternative employment for farm families stranded on the land. If a farmer is failing to make an adequate living on a poor farm and can find no other employment, he may continue to farm in the belief that half a living is better than none. Such a situation might be described as an inflexibility in the relation of labor and land inputs. Such an inflexibility, however, cannot be accepted as a necessary, universal, or exclusive condition of the more general proposition that poor land tends to limit the returns to human effort. Professor Schultz, of course, must insist that the two propositions are necessarily related, since he is going to disprove one by the other.

At this point the author resorts to a most curious demonstration of logic. Let us assume, he says, that in one part of agriculture the ratio of land to labor inputs is absolutely fixed, while in another part of agriculture the entrepreneurs may vary proportions at their discretion.¹² The two factors, land and labor, are the only ones involved; the same product is produced in both cases; and the value product attributed to labor is identical to begin with. However, because of changes elsewhere in the economy, wages of labor rise to a new level, while the price of the farm product remains constant. In that part of agriculture not subject to fixed proportions of land and labor, farmers "... would find it possible to recombine inputs and thus raise the value productivity of human effort to the new level." In the other part of agriculture, the unfortunate farmers are unable to make any adjustment that will bring their labor income up to the new par. The returns to human labor, for this disadvantaged group, must

¹² The author actually postulates two pairs of situations, identifying one with "technical" and the other with "institutional" circumstances which impose the rigidities described. Since the circumstances are not otherwise defined and since they lead to identical results and conclusions, it does the argument no injustice to paraphrase it as a single illustration. The important point here is that the inflexibilities come from technical or institutional conditions and not from differences in the physical characteristics of the land.

remain low, "... regardless of whether the land is level or hilly, fertile or not." This clearly demonstrates, says the author, that the physical characteristics of land have nothing to do with the case.

This is indeed a baffling line of argument. Professor Schultz disagrees with the contention that the use of poor land is associated with inflexibilities in the relations of land and labor units. To disprove this idea, he describes a hypothetical situation in which inflexibilities, by his own definition, are not associated with poor land and are not related in any way to differences in the physical characteristics of land. From this assumption, he proceeds to the other side of the same coin and finds that the incidence of these inflexibilities (with the evil consequences thereof) is nowise related to differences in the physical characteristics of land.¹³ This, he maintains, is proof of the fallacy of asserting any relationship between "poor" land and an inflexibility in the proportions of factor inputs. Professor Schultz is apparently unaware that he first differentiates and then identifies two entirely different kinds of inflexibilities. Perhaps he is anxious to write "Q.E.D.," since he has already implied, over objections noted above, that the relationship between poor land and inflexibilities is a necessary condition of the view that poor land limits the returns for human effort as a result of technical or institutional conditions. By another way of looking at things, it may seem that Professor Schultz has gone to impressive lengths to prove a truism having no particular relationship to a proposition that at best only partially explains a generality on which no one will insist in any particular instance.¹⁴

Professor Schultz enjoys a considerable dialectical advantage over those who feel that most things tend toward a sort of middling gray, rather than wholly black or white. He has asserted, for instance, that the quality of land does not determine the level of returns to the human beings who use it. To deny such a contention is to appear to hold to the exact opposite, although the position defended actually is in opposition to either extreme. It is maintained here, in other words, that whether land is good or poor, judged by physical attributes, appears to have a great deal to do with the welfare of its users in certain cases; in others, the availability of capital goods or location or some other consideration may be more significant.

The defense of a middle ground is often most difficult of all, and one

¹³ Readers are urged to go directly to Professor Schultz' own words. This paraphrase is intended only as a means of identifying portions of the original statement found at the top of p. 208 and in the discussion from p. 209 through part of p. 211, *op. cit.*

¹⁴ It is not always possible, of course, to understand what Professor Schultz is saying, and this fascinating line of inquiry may have reached the point of diminishing returns. It is interesting to speculate, however, on the exact nature of the adjustment that would be made by the unrestricted group of farmers who "... would find it possible to recombine inputs and thus raise the value productivity of human effort to the new level." The assumptions of the hypothetical situation are not altogether clear, but the solution would appear to involve permitting the fortunate farmers to go to the city for either full- or part-time work at the higher general wage level.

sometimes regrets the necessity for picking up straw men that have been knocked over, only to give them another, and more gentle, shove toward the ground. It is quite possible, however, that this dilemma illustrates the most fundamental point of disagreement between Professor Schultz and the land economists. One gets the impression that Professor Schultz is searching for some kind of universal explanation for poverty in agriculture, and that he will continue to be dissatisfied with less pretentious undertakings. Land economists, accustomed to inquire into the complex of circumstances involved in real-life problems, are more inclined to conclude that no single proposition can be expected to explain a series of unique phenomena. Believing that there is likely to be some good in nearly every idea, they are unwilling to discard every generalization that can be proved wrong in a particular context.

These comments have been intended to suggest that land economists are unlikely to agree with Professor Schultz' views of the scope, objectives, and foundations of land economics. Yet it must be stated, however briefly, that the article in question contains some novel and intriguing possibilities. The "retardation hypothesis" will, of course, be welcomed by the land economists who, among others, have given their attention to economic location, site, and transportation as factors related to economic welfare. Professor Schultz, however, has given the old idea a new twist. He is not so much interested in the relation of location to cost and price differentials—the conventional approach—but in the relation between location and "imperfections" in the capital market. When an investigator sets himself to look into "imperfections," he has apparently begun to question the traditional assumptions of perfect competition, perfect mobility of the factors, and perfect economic rationality on the part of decision makers. Furthermore, the "retardation hypothesis" implies some kind of regional approach to economic analysis. The proposition rests on the assumption that one area is not like another, and that insight into economic affairs demands a willingness to inquire into the specific circumstances of a given situation. Professor Schultz, in other words, is beginning to talk like an institutional economist, and this departure will surprise and delight many of his colleagues.

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WARTIME PRODUCTION ADJUSTMENT STUDIES—AN EXPERIENCE IN JUDGMENT ESTIMATING

THE Land Grant Colleges and the various agencies of the United States Department of Agriculture are now engaged in a cooperative project designed to appraise the productive capacity of American agriculture during an indefinite period of high-level defense activity. Essentially this project attempts to muster the research experience and informed judgment of a group of agricultural technicians in each state to develop estimates of production possibilities in the different farming areas, the improvements in production that would be practicable, and the resources and incentives it would take to achieve increased production.

How well can such a job be done and what is the reliability of the estimates prepared? No definitive answers can be given to these questions. Estimates such as these all involve projection into the future under a set of assumed conditions. Only if the assumed conditions actually develop in approximately the pattern visualized is it possible to check the adequacy and reliability of the projections.

One of the nation-wide adjustment studies made during the last war is amenable to such a check. This was the study of "Peacetime Adjustments in Farming in the United States" made in all states by committees of technicians during the spring and summer months of 1944.¹

The task assumed by the State Committees was to analyze the then current status of agriculture after four years of full-scale production for war, to consider the meaning for postwar years of the war-induced changes, and to appraise and indicate the adjustments it would pay farmers to make under specified postwar conditions. In brief, these assumed conditions were high levels of employment, industrial activity, and national income; and a relatively favorable relationship between prices received for farm products and prices paid by farmers. Price estimates for agricultural commodities consistent with this general framework were supplied the State Committees. It also was assumed that supplies of fertilizer, machinery, and other production goods would not be limited. The work of each State Committee, then, was essentially that of taking the specific farm prices assumed and estimating the quantities of each product that it would pay farmers to produce—with enough time to adjust to these prices and with the twin objectives kept in mind of restoring and maintaining physical resources and providing stabilized and satisfactory levels of farm living.

As was pointed out at the time, such estimates do not represent forecasts of what farmers would do, even though the assumed conditions prevail. Rather, they represent profitable possibilities that can be attained if the

¹ The state reports were summarized nationally by the Bureau of Agricultural Economics and published as Miscellaneous Publication No. 595, *Peacetime Adjustments in Farming—Possibilities Under Prosperity Conditions*, U.S. Department of Agriculture, December 1945.

necessary changes and adjustments are made by farmers. These estimates, then, provided a "bench mark" as first approximations of the possibilities of the agricultural sector in a national economy of essentially full production. The postwar bench-mark year was considered to be 1950 when a date was essential for the analysis.

As it turned out, conditions during the last few years of the 1940's conformed in major outlines to those assumed for the study. The general levels of prices and incomes were higher than those assumed; but the average relation of prices paid by farmers for all commodities, interest, and taxes, to prices received for farm products, was very close to that assumed. Some comparisons of the projections prepared in 1944 with actual production in 1949 and 1950 are therefore interesting.

The national summary estimates indicated a postwar bench-mark level of total farm output of 144 (1935-39=100) compared with 125 in 1943, the last year for which data were available to the committees when the work

TABLE I. FARM OUTPUT, CROP PRODUCTION PER ACRE, AND TOTAL FARM EMPLOYMENT
POSTWAR BENCH-MARK WITH COMPARISONS, UNITED STATES
(1935-39=100)

Item	1935-39	1943	Bench- mark ^a	1949	1950	1951 ^b
Farm output	100	125	144	140	137	143
Output of:						
Meat animals and animal products	100	139	149	139	142	—
Crops and pasture	100	116	133	131	126	132
Crop production per acre	100	116	134	134	128	135
Total farm employment	100	97	91	92	89	—

^a *Peacetime Adjustments in Farming, 1945.*

^b Prospective or proposed.

was done in 1944. Farm output in 1949 was 140 and in 1951, it may possibly be 143 (Table I). The projections for output from crops and pasture were more nearly realized than that for meat animals and animal products.

One of the chief considerations of the 1944 study was the effect of more widespread adoption by farmers of improved practices. The postwar bench-mark estimate was an index of 134 for crop production per acre for all crops grown. This represented an increase of 16 percent above the 1943 level—a rather startling figure at the time to many people who were already impressed with the significantly higher yields of the war years compared with the prewar years. However, the composite yield index in 1949 was the same as the Committee's projection, and it was exceeded in 1948, a year of unusually favorable weather.

Projections of trends in farm employment were likewise almost identical with actual developments.

The Committees were asked to estimate the quantities of fertilizer it

would pay farmers to use under the assumed price-cost relationships. The postwar bench-mark estimates and actual consumption of the three major plant nutrients in 1949 and 1950 are shown in Table II. At the time they were released, the bench-mark projections looked almost fantastic to some people. They were critical of the practical value of such estimates in terms of possible realization. Yet in the case of nitrogen the bench-mark estimates were practically attained by 1949, and the estimates for phosphoric acid and potash were not at all unreal when we consider that shortages of fertilizer have developed in some areas in most years since the war. If the latter two nutrients were freely available, it seems likely that their use in 1951 and 1952 would be not far below the Committees' estimates.

From the standpoint of broad changes, indications of direction, and degree of gross measures of output, the Committees appear to have done an exceptionally good job. When comparisons are made of projections and actual developments for specific commodities the record is not so clear, nor

TABLE II. COMMERCIAL PLANT NUTRIENTS, POSTWAR BENCH-MARK WITH COMPARISONS, CONTINENTAL UNITED STATES

Item	1935-39 ^a	1944 ^a	Postwar bench-mark ^a	1949 ^b	1950 ^b
	1,000 tons	1,000 tons	1,000 tons	1,000 tons	1,000 tons
Nitrogen (N)	335	594	1,079	1,005	1,030
Phosphoric acid (P ₂ O ₅)	702	1,279	2,763	1,910	2,060
Potash (K ₂ O)	352	620	1,534	1,070	1,125
Total plant nutrients	1,389	2,493	5,376	3,985	4,215

^a *Peacetime Adjustments in Farming, 1945, Table XII.*

^b *The Fertilizer Situation for 1950-51.*

at first glance so impressive (Table III). For instance, production of milk and potatoes in 1949 was only 81 and 78 percent, respectively, of bench-mark estimates, whereas production of flaxseed and soybeans was 155 and 147 percent, respectively, of bench-mark estimates.

A closer look at these variations in individual commodities in terms of relative departures of actual prices from the assumed ones used in the 1944 study provides at least a partial explanation. In this note comparisons are made with 1949 production because weather conditions were generally somewhere near normal that year; also, no control programs were in effect except those for peanuts and tobacco. Average prices received by farmers in 1948 for crops and average 1948 and 1949 prices for livestock probably represent fairly well the prices to which farmers responded most in planning their 1949 production programs.

The general level of farm prices received and paid by farmers in 1948 and 1949 was much above the prices assumed for the 1944 study. Most significant, however, are the departures of prices of particular products from

TABLE III. COMPARISON OF POSTWAR BENCH-MARK ESTIMATES AND ACTUALS, FOR SELECTED COMMODITIES

Item	Unit	Production				Prices			
		1943	Postwar bench-mark estimate	1949	Percentage 1949 of bench-mark	1943	Postwar bench-mark assumed	1948 ^c	Percentage 1948 of bench-mark
		Millions	Millions	Millions	Percent	Dollars	Dollars	Dollars	Percent
<i>Crops</i>									
Soybeans	Bu.	193	137	231	147	1.81	1.70	3.13	184
Peanuts	Lb.	2,185	2,396	1,878	79	.071	.050	.103	206
Flaxseed	Bu.	52	28	44	155	2.84	2.25	5.85	260
Cotton	Bale ^a	11.4	14.9	16.1	108	.20	.13	.32	246
Potatoes	Bu.	465	524	412	78	1.38	1.20	1.53	127
Dry beans	Cwt.	20.9	18.2	19.9	110	6.01	4.70	10.20	217
Wheat	Bu.	841	914	1,141	125	1.33	1.10	2.15	165
Corn	do.	3,034	3,243	3,379	104	1.12	.90	1.88	209
Sorghums	do.	104	131	153	117	1.16	.80	1.28	100
<i>Livestock and livestock products</i>									
Milk	Cwt.	1,181	1,482	1,192	81	3.14	3.10	4.41	143
Eggs	Doz.	4,521	5,026	4,710	94	.37	.29	.466	160
Hogs, net production	Lb. ^b	24,338	21,631	20,190	93	13.70	11.25	20.70	184
Cattle and calves, net production	Lb. ^b	18,419	20,398	10,352	95	11.80	10.25	21.10	203

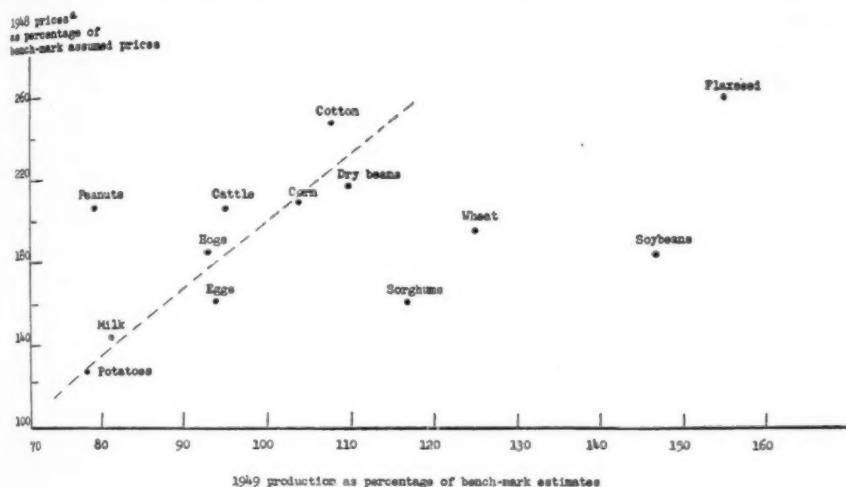
^a Prices per pound of lint.^b Prices per hundredweight of net live weight produced.^c 1948 and 1949 average prices for livestock and products.

those assumed. Prices of flaxseed, for instance, were 260 percent of the 1944 assumptions, but prices of potatoes were only 127 percent. Prices paid for items used in farm production were about 60 percent higher in 1948 than were assumed in the 1944 study.

Plotting the production and price ratios between the bench-mark estimates and 1948 or 1949 actuals, as in Figure 1, indicates a major reason for departures of production projections from actuals. The regression line represents the average relationship in the central group of commodities and roughly approximates a gross supply-price response curve. Most of the major commodities come close enough to this line to suggest that, if the Committees had been supplied price and other assumptions approximating those that actually prevailed in later years, their estimates of production would have been closer to the actuals.

Peanuts appear on the chart where they would be expected to fall in view of an effective acreage control program. The departures on the chart not so easily explained are those for sorghums, wheat, soybeans, and flaxseed—all of which are far to the right in terms of a price departure explanation. Interestingly enough, all of these are crops that have been highly mechanized. Also, postwar demands for at least three of the four have been far in excess of any previous experience. Perhaps the Committees could not visualize at the time any such developments in terms of aggregate demand. Undoubtedly they were also influenced considerably in preparing their estimates by considerations of conservation needs. Both wheat and soybeans were considered by many to be overexpanded in terms of long-time desirable rotation and conservation needs.

Even though some of the estimates prepared in 1944 departed considerably from the actual or exceeded any foreseeable demand, they nevertheless pointed toward some trouble spots that later developed. Most dramatic was the case of potatoes. The aggregate of Committee estimates was a postwar production of 524 million bushels of potatoes. Ob-



* For livestock and products, 1948 and 1949 average prices were used.

FIG. 1. PRICE AND PRODUCTION RATIOS BETWEEN BENCH-MARK ESTIMATES AND ACTUAL.

viously the assumed price, although moderate in terms of past experience, was too high in view of the new techniques available to farmers, and the estimated production far exceeded prospective demand. But it did sharply focus the approaching difficulties with potatoes and might have been used more effectively in anticipating and planning for needed adjustments in the industry.

On balance and in retrospect the State Committees in 1944 did a remarkably good job of visualizing production potentials under the conditions assumed for the postwar period. Although the purposes and objectives of the current appraisal of production capacity during a period of high-level defense differ somewhat from those of the 1944 study, main reliance will again be placed upon the research experience and informed judgment of a group of agricultural technicians in each state to develop the estimates. The experience of the 1944 study provides a basis for satisfaction with this approach and considerable assurance concerning the reliability of these group judgments. It should strengthen the confidence of those who will make use of the results of the current project in planning agricultural programs.

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NEGOTIATED WAGE PAYMENTS IN BRITISH WEST
INDIAN AGRICULTURE*

THE concurrence of collectively bargained conditions of employment and piece rate payment systems is very common in industry, but rare in agriculture, in the United States. The joint occurrence of these two conditions does exist in the sugar industry of the British West Indies. A typical example is cited from the island of Antigua in the British Leeward Islands.

Antigua produces annually about 23,000 tons of raw sugar extracted from about 170,000 tons of cane, harvested from 12,000 acres. There is some fluctuation in the cane crop because of drought conditions which the island occasionally suffers, but the number of acres in cane is more or less constant. About one fourth of the crop is grown by peasants operating small plots ranging in size from a fractional part of an acre to several acres, which are usually rented for cash; three fifths is grown on the estates of a large cane growing corporation, which has about 7,800 acres in cane; the remainder is grown by private estates, each several hundred acres in size.

Estate cane is planted, cultivated, and reaped by wage labor. About 1,500 wage workers are employed in the cane fields. There is not very much inter-seasonal fluctuation in employment because the Antiguan industry takes only two ratoon crops and replants each year one third of all land devoted to cane. The more frequent replanting in Antigua than in other sugar cane producing regions creates in the out-of-crop season more jobs to which workers transfer when the crop is taken in.

The wage workers in the industry are represented for collective bargaining purposes by the Antigua Trades and Labour Union. The Union negotiates each year with the representatives of estate employers a Memorandum of Agreement which defines the terms and conditions of employment. During the period for which the collective agreement is effective, the Union participates in its administration by representing workers in the adjustment of grievances and by negotiating interpretations in the application of the agreement to particular situations which arise in the intra-contract period.

The collective agreement codifies a practice which stems from customs current when the industry operated with slave labor, when slaves were assigned daily tasks. After emancipation, the practice of task work was transferred to the regime of free labor and wage payments were made also by the task.

* This note was prepared from materials collected during the period of a fellowship grant of the Social Science Research Council.

Over the course of time, a complicated system of task definitions has been developed which has become progressively more refined. The contract for the 1951 crop year specifies rates for five different occupational classes of reaping crafts and six different classes of cultivating crafts, including an omnibus class called "various." Within each class it has been found necessary to establish differential rates for differential tasks, and the exercise of considerable ingenuity is sometimes required to allow for variable factors that are relevant to the task rate.

The rate for cane cutters, for example, is paid by the "line" of 100 feet of cane cut. A "line" of cane is related to the tonnage cut, which is the more significant measure, by estimating the yield of cane in each field and setting a line rate which is variant with the estimated yield. Yield estimates are prepared for about 500 different fields on the estates. The task rate per line of cut cane is then set as a function of the yield estimate, the width of the bank (since the line measures the length of the area cleared of cane but not its breadth), and whether the cane is a plant or a ratoon crop. If, at the end of the crop, any field is found to have produced in excess of four percent more cane than had been estimated, supplementary payments are made to the cutters.

The measures for the task payments vary with the class of work done. Cutting, loading, ploughing, and forking are paid for by the line; planting is paid for by the 1,000 plants; farming (cultivating, weeding) is paid for by the acre; carting pen manure, by the cubic foot; tying cane tops, by the bundle; dropping pen manure, by the hole; packing cane, by the ton.

In the end, what has developed in the British West Indian Sugar cane industry is a complicated incentive wage payment system which staggers the understanding of outsiders. Tested by pragmatic experience, however, the system seems to work. Both the workers and the managers in the industry know the system intimately. Rate measures for the different classes of work have been used for so long without change that they have become entrenched in the complex of institutions of the agricultural community. The Union of the workers does not object to the practice and employers insist that a changeover to time rates would enormously depress the man-hour output of labor.

Since the system "works," it would seem to be reasonable that it be retained by the industry. Questions have been raised, however, as to the system's efficiency. Some seem to be without validity. It has been objected, for example, that the Union's tendency is to claim that new task operations are more complicated or onerous than they are in fact, so that the task will be priced high. Every departure from standard production practice involves new calculations of price. The effect is, therefore, according to this line of argument, that managers are reluctant to introduce innovations and

that the piece-work rate payment system tends to fix methods of production. The truth is, however, that in any collective bargaining framework, whether a regime of time-work or one of piece-work payment prevails, the attempt is made to negotiate the relationship between the rate of pay and the character (volume and skill) of the work done. In a time-work rate system, the hourly or daily rate, once negotiated, is taken as datum and the Union attempts to control the work for which it exchanges by, for example, regulating the pace of the workers. In a piece-work rate system, the work to be performed is taken as datum and the Union attempts to control the price. Fundamentally, the Union's objective and the problem with which management is confronted because of the Union's pursuit of its objective are identical in the two cases. The objection to piece-work wages on this score falls to the ground.

A second objection seems to be on no more solid ground. In the task rate system in the West Indian sugar industry, a wage structure is constructed which relates piece rates to each other. The amounts paid per task appear clearly in the agreement. The hourly earnings complex which corresponds to the piece rate structure, however, is obscured.

Since there is little or no exact knowledge of the time necessary, on an average, to perform the tasks for which rates are set, the hourly rates and the hourly rate structure implied in the task rates are not seen in the agreement.

The rate for cart-men, for example, is set by the agreement at one third or one half of the cutter's rate per line of cane, depending upon whether the cart-man is paired with two or only one loader in his work group. The industry assumes, from this rate relationship, that the higher rate attaches to the cutter's job. In fact, when piece rate earnings were converted to average hourly earnings for sample in-crop months of 1947, 1949 and 1950, it was found that cart-men's average hourly earnings exceeded those of cutters in all three years and that they were 20 percent higher than cutters' earnings in 1950.

The objection which is sometimes voiced to reckoning job prices in task rate measures, is based on the quality they have of hiding relative occupational hourly earnings. This quality, it is said, makes it difficult to construct a rational rate structure. This objection, too, is not well-founded. A rate structure may be counted as rational, if it fills two needs:

- 1) if the workers in different occupational classes consider that the system or relative compensation paid for their services somehow fulfills the requirement of "justice," and
- 2) if the relative rates perform efficiently the function of regulating the allocation of labor among alternative uses in conformity with market forces.

Clearly both purposes can be fulfilled by piece rate systems, and perception of relative hourly earnings in different occupations is not a necessary pre-condition to efficient performance of the wage structure.

It is true that wage payment by results in unionized agriculture is administratively cumbersome and that the administration of such a system means much managerial time given to job price setting and task performance measurement. Despite this, where the system has had a long history within a pre-union framework, as it has in the British West Indian canefields, collective bargaining can be grafted to it successfully and, by pragmatic test, it seems to be satisfactory.

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SOME THOUGHTS ON GERMAN AGRICULTURAL POLICY

*An open letter to a German friend**

Government and agriculture in Germany are faced with the need for making decisions as to the kind of agricultural policy they should and could safely pursue over the years to come. A friend in Germany who, himself is keenly interested in these problems has recently suggested that it might stimulate a useful public discussion if some of us, who are somewhat familiar with Germany's situation, would express our views on the subject. The following "open letter" is in response to this suggestion.

Dear Friend: You have given me a somewhat difficult assignment in asking for some views on desirable agricultural policies in Germany. None of the possible answers to the question as to what Germany's or any other country's agricultural policy should be to best serve the nation's long-term interests can be completely unequivocal. And the answer must largely be in generalities—if it is to fall short of an extensive treatise. Therefore, surely, you do not expect more than an opinion regarding a few basic contentions or program points. Their acceptance or rejection would then call the tune with respect to the many details of policies and measures that must be considered in the day-to-day business of policy implementation. Their acceptance or rejection would distill the spirit which would permeate the individual chapters of policy.

I should like to confine myself, in these remarks, to a word about the place of technological progress in an economic policy for agriculture; to a note regarding prices in relation to "world price levels"; and to a reflection on the general economic setting which will influence further expansion of production of food crops and feedstuffs on the one hand and of livestock products on the other.

* This statement expresses the personal viewpoint of the writer and does not necessarily reflect official opinion.

I am sure we would all agree on the broad principle that economic policy in general, and hence agricultural policy, should be directed toward facilitating the best possible use of the resources the nation possesses or could draw upon in peaceful competition with all other nations of the world. But concrete suggestions as to the practical content of such policies that fit the realities of the world and situation in which we now live are a far cry from the acceptance of any broad general principle. Life is more complicated than is its philosophy, theory much simpler than its practice. Or, as one of the great German poets has put it: "Leicht beieinander wohnen die Gedanken, doch hart im Raume stossen sich die Sachen."

I do not have to tell you, who live on one of the frontiers of the Western World, how far we are from a situation in which our economic policies could forget about considerations of international politics and national security. Nor do I have to tell you, whose economic strength has been weakened by the course and consequences of a terrible war, that, with no reserves to draw upon, any nation would find it difficult to take unlimited chances upon the rapid emergence of a free and liberal world of economic intercourse among the nations in which an international division of labor according to comparative advantage and fair competition could be established and secured. We all know about these handicaps to common-sense policy throughout the world. But if we cannot do the best, we must no doubt strive for the second best. Our problem, then, is to assist in devising policies which *among the practical alternatives* promise the best possible use of the resources at our command.

There is no doubt that Germany's agriculture is one of the most important resources on which the nation can draw within its own borders. To conserve and strengthen it would therefore seem a basic requirement of national policy. Especially in an international situation such as we now have, and may have for a long time to come, it is essential that agricultural production be maintained and expanded. In special circumstances which may face us at any time that may even have to be done at any cost. But it is well to remember that in the long run, and for a more nearly normal time, we should not merely suggest that farmers produce more, but rather that they produce it more economically.

If technological improvement and progress are defined as a betterment of input-output relationships—as an increase in physical output from a given utilization of physical resources—then it would appear that technological improvement would be a sound program goal, no matter what the economic circumstances in which it is conceived. This is why I believe that improvements in farm management should rank among the highest and most immediate priorities of agricultural policy in any country. Better feeding practices, better grassland management, better seeds and more

selective fertilizer application are perhaps the simplest examples of progress of this type for which it is obvious that a given input or cost would result in larger return. Consolidation of scattered holdings, modernization of old and construction of new farm buildings, and mechanization to save labor and permit more timely farm operations, fall into a second category of technological improvements for which a betterment of input-output relationships is highly probable, though not certain, because they require additional investments and generally larger input of resources for which these utilizations must compete against other demands.

You may say that even in the first category of improvements there is a social cost involved that will not directly appear in the accounts of the agricultural enterprise, but in the costs of research and education and of the agricultural administrators who must provide the advisory services for the farmers' guidance and assistance. This is no doubt true. But in many cases a better use of the human resources already available and a freer rein for organizational skill, in which the German race abounds, can do much with but little increase in costs.

When we consider the economic incentives that the farmer should have to pursue his productive effort, and the price-cost relationships that determine, to some extent at least, the pattern of production, we find ourselves on much more controversial ground. Offhand I should like to say frankly that costly price support schemes which wealthier nations, in a quest for balance among their national, economic, and political policies, may apply, would seem to be risky undertakings for a country like Germany whose economic strength has been greatly weakened. Equally frankly I should like to admit that in Germany as well, political considerations within the framework of democratic government, and perhaps even considerations of national and social policies, may tend to favor, at times, a similar course. But it seems to me that the economic basis for it does not at present exist.

With world prices, managed or unmanaged, what they now are and what, in my view, they promise to be for some to come, I believe that German agriculture can well hold its own without too much artificial support. On the other hand, the general aim of restoring balance for the economy at large, both internally and externally, would also seem to make it inadvisable to hold permanently internal prices for some farm products measurably below their import price equivalents, particularly for so formidable an import item as grains. The recent adjustments made in German grain prices have been oriented toward this principle.

With regard to such a policy of approximate price adjustment to so-called world price levels, livestock products no doubt present the most difficult problem. But it is one, I believe, that cannot be solved, in any

case, by manipulation of producer prices. For the prices of livestock products and of other quality items are determined to a greater extent than are those of the cheaper foodstuffs by the conceivable changes and trends in the purchasing power of consumers. If general economic activity and national income in Germany stand at high levels, the livestock farmer will benefit, notably since the supply of the population with animal products is still much below what it should be, or what it was before the war. Germany, however, still has a long way to go to regain economic strength and prosperity. To live within her means, she must be able to expand general production possibly without expanding consumption for some time, especially if the requirements for investment and defense go up. In such a situation the unbridled behavior of economic magnitudes—tending toward a restoration of balance between income and expenditure—would be in the direction of lower consumer expenditure or higher all-round consumer prices, favoring expenditure on prime necessities or cheaper categories of goods, and curtailing expenditure on more expensive items.

In such circumstances some pressure on agricultural production toward larger output of vegetal foods and relatively larger feed self-sufficiency would not be an altogether unhealthful development. If it is considered that it is in the output of grains, sugar, and fats that Western Germany is so basically deficient, such a trend is at least a possibility. I do not have in mind any curtailment of livestock output to which German agriculture's natural conditions are well suited. Rather, I am alluding to the possibility of further increases in the output and direct sale for consumption of products of the soil, with some lag in the expansion of the output of livestock products. Even for livestock products the possible influence of general economic conditions which I have mentioned could be neutralized by technological progress, such as in feeding practices for both hogs and dairy cattle, and in grassland management, which would save resources and thus reduce costs.

In expressing these general views I do not mean to imply that it would be inadvisable for German agricultural policy to aim at the greatest possible seasonal stability of prices; or to protect farmers from essentially temporary world market developments or from other countries' dumping policies, for example, strong competition in livestock products produced from subsidized feedstuffs. Nor do I think that all subsidies to agricultural producers should in practice be ruled out. Of all such subsidies it would seem to me that a subsidization of fertilizer prices, with its channeling of such payments into selective productive uses, is perhaps the least objectionable on general economic grounds.

Within the framework of the general policy which I have indicated and which I know is favored by many competent German experts, it would

appear that the way is cleared for genuine support on the part of Germany of the program of trade liberalization. There may be critical periods, such as the one Germany now faces in its EPU relations, when the country cannot play full part in liberalization. But basically Germany's general prosperity is bound up with high levels of foreign trade, hence any measures that would promote trade would be in the broad interest of the country's economic development. Only at high levels of foreign trade can consumer incomes rise; and it is on such an increase that the welfare of agriculture depends. Naturally, effective trade liberalization presupposes give-and-take on the part of all participants and for all segments of industry, so that increased trade can not only move but can also be paid for. Common sense in economic policy over much of the world is perhaps not so well established that we can be sure of trade liberalization's becoming anything other than a slogan for the other fellow to heed. But should it become actual, Germany's championship of liberalization would in the end find a bountiful reward.

If I may summarize my view as to the developments that would be in store for German agriculture if the above policy were to apply—important parts of which I know are already in effect—I would say that German agricultural production would on the whole expand further, barring shortages in manpower and chemicals for agriculture which any large-scale increase in defense production may yet entail. Production of grain, especially wheat, of sugar beets, and potatoes would probably increase, production of oilseeds might decline. Under trade liberalization there might also be a reduction in the output of vegetables, while livestock production would be forced to compensate, under the influence of keener competition, by technological improvements in feeding and feed production. I should not expect that these policies would entail critical developments for German agriculture. On the contrary, following some transitional difficulties, they would redound to its benefit, since they conform to sound economics and to the realities of Germany's general economic situation and requirements.

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RELATION OF INHERENT SOIL PRODUCTIVITY TO DEBT-PAYING CAPACITY OF MINNESOTA FARMS

DATA contained in the annual reports of the Southwestern Minnesota Farm Management Service, sponsored by the Division of Agricultural Economics, University of Minnesota, form a basis that may be used to test the effect of modest differences in *inherent* productivity as measured by acre yields upon the debt-paying ability of farmers in that area. These particular farms, varying in number year by year from 131

to 166, averaged 268.0 acres in area, of which 200.2 were in crops; 19.8, in tillable pasture; 3.9, in tillable land not cropped; and 44.1 acres were in non-tillable pasture, native hay, farmstead, roads, and waste.

Upon the basis of the actual cropping system on these farms, during 1940-49 inclusive, the following would have been the amount of increased production that was equal to 10 and 15 percent respectively of the actual production:

Crop	Actual acres 1940-49	Average yield bu. or tons	Actual production bu. or tons	10% of total production bu. or tons	15% of total production bu. or tons
Soybeans	9.8	16.1	157	15.7	23.5
Corn	85.2	48.8	4,158	416	624
Tame hay	23.3	2.1	48.9	4.9	7.8
Small grain and miscellaneous ^a	81.9	43.4	3,554	355	533

^a For convenience, all of the acreage devoted to small grains and miscellaneous crops has been figured as if oats had been the only crop in this category. As oats usually have less acre value than either flax or barley, this procedure somewhat understates the advantage of higher yields. The actual distribution of the crop acreage, except corn, soybeans, and hay, was as follows: oats, 42.6 acres; flaxseed, 25.9 acres; barley, 9.7 acres; canning peas, 0.9 acres; wheat rye, millet, and buckwheat, 2.8 acres; total, 81.9 acres.

During the 1940-49 period, the average Minnesota farm prices of four crops were as follows:

Soybeans.....	\$ 2.02 per bushel
Corn.....	1.05 per bushel
All hay.....	10.51 per ton
Oats.....	.59 per bushel

All hay is used rather than tame hay as season average farm price figures are given only for all hay. This results in a modest understatement of the advantage of the extra hay production since wild hay is worth less per ton than the tame variety, and wild hay is roughly 25 percent of all Minnesota hay.

Upon the basis of the foregoing prices, the increased 10 and 15 percent production would be valued as follows:

Crop	Av. value of 10% of actual production 1940-49 inclusive at foregoing prices ^a	Av. value of 15% of actual production 1940-49 inclusive at foregoing prices ^a
Soybeans.....	\$ 32	\$ 48
Corn.....	437	656
Tame hay.....	51	76
Oats (as representative of small grains and miscellaneous crops).....	209	313
Total.....	\$729	\$1,093

^a It was assumed that the production of pasture and native hay from the non-tillable acreage was the same in each of the three cases.

If one imagines a composite farm, such as the average farm here presented; and nearby, another farm identical in every respect except that because of better inherent productivity of the soil, due to such factors as drainage, topography, and texture, the second farm produces a 10 percent greater volume of crops, how much more mortgage debt, other factors being equal, can the second farm carry than the first? Again, suppose a third farm that has 15 percent greater productivity than the first, how much more mortgage debt can it carry than the first? The preceding figures indicate that under the yields and prices prevailing in the 1940-49 period, the second farm would have had products worth \$729 more than the first and the third farm would have had products worth \$1,093 more than the first.

If one assumes that each of these farmers had a level payment, $34\frac{1}{2}$ year mortgage, calling for an annual payment of \$54 per thousand for amortization and interest, then the extra debt-carrying capacity of the \$729 coming from extra crop production would be $\$729 \div \0.054 or \$13,500. Upon the basis of 268 acres, it would be \$50 per acre. If one assumes a 25-year Springfield Plan loan, then the payments in the first year, under a 4 percent interest rate plus 4 percent for amortization would be 8 percent annually and the extra debt-carrying capacity in the first year would be $\$729 \div \0.08 or \$9,112 or \$34 per acre and, as with all Springfield Plan loans, the annual payments would become less year by year as interest charges decrease.

If one assumes \$1,093 more product because of 15 percent more production, then in the case of the $34\frac{1}{2}$ year mortgage, the extra debt-carrying capacity would be \$20,240 or \$76 per acre. In the case of the 25-year Springfield Plan loan, the extra debt-carrying capacity during the first year would be \$13,668 or \$51 per acre.

In practice, a substantial portion of the extra production would be converted into livestock and livestock products, and thereby a substantial return in addition to the \$729 or \$1,093 would be secured.

Conversely, it is important to note that a farm having an inherent productivity of 10 to 15 percent less than the average of the group would have very little debt-paying capacity.

No data as to the sale prices of these farms are available. The 1945 Census of Agriculture reported that the average value per acre of all farms in each of the nine counties in which the cooperating farms are located varied from \$75 to \$109 per acre. Upon the basis of census figures, and with allowance for the fact that the farms of cooperators are superior to the average, it may be roughly estimated that the farms under consideration had a sale value of \$110 per acre or more as of early 1945. As the prices of products used were the average of 1940-49 inclusive, 1945 sale prices would be a

rough index of the land value prices per acre that correspond to the product prices used.

These data suggest that as yet we only partly appreciate the big differences in debt-paying capacity and real estate loan values created by relatively small differences in inherent productivity.

In giving consideration to the foregoing, one should keep in mind the following:

1. Since as one's income increases there is a tendency for a portion of the extra income to go into family living, probably not all of the extra income would be applied on the mortgage.
2. The assumption as to differences in income is based upon inherent differences in the soil. Applying the principle here outlined to lending operations in a successful way with reasonable accuracy means that a difference in inherent productivity of four to five bushels per acre in the case of corn and oats in southern Minnesota must be accurately detected by appraisers. This raises the question as to the margin of error that may be expected in the case of well-trained appraisers, and suggests that farm land appraisal with reference to the debt-carrying capacity of an average operator is subject to a wide margin of error. This would be true even under a static price level.
3. If the borrower rents the farm to a tenant, it is likely that the landlord would divide the extra income with the tenant upon the basis of the usual share arrangement; thus if tenants in the area customarily get three fifths of the crop, the tenant would probably get three fifths of the crop, whether the farm were one that produced the same yields per acre as the average of the locality or 10 to 15 percent more than the average.
4. It is assumed that the expenses in each case would be the same. This is believed to be substantially true, especially as combines and corn pickers create expense on an acre basis rather than on a bushel basis.

Hauling the extra produce to market plus a little extra storage capacity would appear to be about the only extra expense involved. If the assessor were a well-trained soil technician, he might add a bit to the assessment because of the extra productivity, but in practice it is likely that the assessments of three farms in the same locality—having inherent productive capacities of 100, 110, and 115 respectively, would be almost identical.

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* This statement expresses the personal viewpoint of the writer and does not necessarily reflect official views.

PRICE DISCRIMINATION WITH FIXED SUPPLY

IT HAS always bothered me somewhat when teaching price analysis to deal in a practical way with the question of price discrimination and its corollary, product division between markets. Most texts resort to graphic methods of analysis and lamely end up by saying the marginal revenues in the two markets should be equalized to attain maximum revenues. One of the basic assumptions generally seems to be that supply of product is perfectly controllable. This is unrealistic for agriculture, as in any given market period the supply is generally a fixed quantity. We are going to produce so much wool this year and nobody is going to tell the sheep differently. Therefore, we must maximize the revenue between markets with a given amount of product. It is also assumed that the demand curves are known for each market.

First will be stated the general case in algebraic terms, and then a linear example will be worked through for students who have as much difficulty as I in interpreting symbols.

Given the demand relations

$$Y_1 = f_1(x_1)$$

$$Y_2 = f_2(x_2).$$

Given the quantity of product to be divided between markets

$$k = x_1 + x_2$$

$$\text{or} \quad x_2 = k - x_1.$$

Objective to maximize total revenue which is

$$R = x_1y_1 + x_2y_2.$$

Translating to terms of x_1 from above

$$R = x_1f_1(x_1) + (k - x_1)f_2(k - x_1).$$

Now for the example:

Given the demand equations

$$y_1 = 7 - x_1$$

$$y_2 = 4 - 2x_2.$$

Given the quantity

$$k = 3 = x_1 + x_2$$

$$\text{or} \quad x_2 = 3 - x_1$$

$$R = x_1y_1 + x_2y_2$$

$$= x_1(7 - x_1) + (3 - x_1)[4 - 2(3 - x_1)]$$

$$= -3x_1^2 + 15x_1 - 6$$

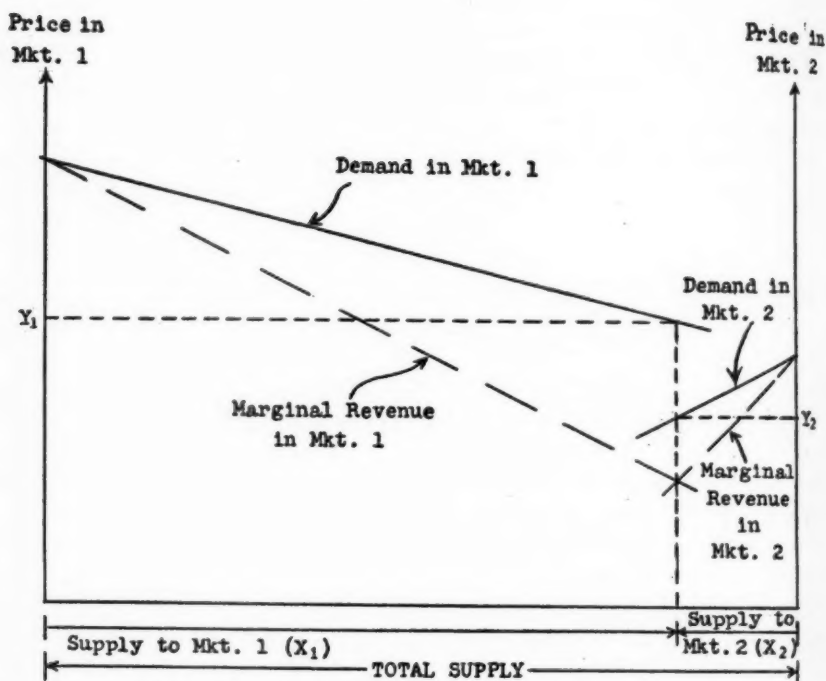
$$\frac{dR}{dx_1} = 15 - 6x_1 = 0$$

$$x_1 = \frac{15}{6} = 2.5$$

$$y_1 = 7 - 2.5 = 4.5$$

$$x_2 = 3 - 2.5 = 0.5$$

$$y_2 = 4 - 2(0.5) = 3.0$$



Marginal revenues in the two markets are equated at point A.

Fig. 1

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FARM PRICE SUPPORTS AND THE RETAIL PRICE OF FOOD SINCE WORLD WAR II

THE substantial stocks of direct food products and feed grains, stimulated by and resulting from price support programs, have helped hold down inflationary increases in food prices in recent months. In addition, the price support programs, especially those for dairy products and eggs, encouraged producers to maintain their normal breeding herds and flocks when unsupported market prices would have caused substantial liquidations. Current production of dairy products, eggs, and several other farm commodities was higher in 1950 and is higher today than it would be if there had been no price support programs following World War II.

The value of direct food products and feed grains under price support loans or owned by the Commodity Credit Corporation on June 30, 1950, and April 30, 1951, was as follows:

	June 30, 1950	April 30, 1951
Dairy Products	\$ 164,878,000	\$ 10,991,000
Eggs, dried	103,290,000	65,649,000
Beans and peas, dry edible	89,653,000	67,008,000
Cottonseed oil	2,556,000	40,000
Potatoes and potato starch	1,160,000	542,000
Peanuts	4,072,000	21,064,000
Rice	4,429,000	3,369,000
Wheat	825,559,000	740,780,000
Corn and other feed grains	1,248,080,000	1,003,459,000
Total food products and feed grains	\$2,443,677,000	\$1,912,902,000

The existence of government food and feed grain stocks in excess of two billion dollars has been a decisive factor in stabilizing the price of these products, preventing many of them from rising to parity level. The release of these stocks as prices reached the loan or resale level increased the total quantity of these products available in the July to April period over those which would have been available in the absence of price support programs in earlier years.

The continued liquidation of these stocks as prices reach resale levels will keep prices of these commodities from going still higher until the stocks are exhausted. Price rises and pressure on price ceilings in the months ahead will be slowed down by the availability of accumulated stocks totaling nearly two billion dollars arising from price support programs. Fully as important, these stocks will supplement current production, making more food available to consumers in the months ahead than would have been possible without the price support programs.

Earlier Effects of Programs

The question is often asked, "Why have food prices increased so sharply since the end of World War II in September 1945? How much have govern-

ment price support programs contributed to the rise in retail food prices since 1945?"

The key facts regarding the increase in food prices relative to other price increases are as follows:

	September 1945	April 1951	Percentage Increase
Retail food price index (1935-39=100)	139.4	225.7	62
Farm price index (1910-14=100)	197	309	57
Marketing and processing charges (1935-39=100)	115	174	51
Average hourly earnings of workers in manufacturing	\$.99	\$ 1.57	59
Wholesale price index (1935-39=100)	105.2	183.5	74

Retail food price increases since 1945 have been in line with other price increases. Hourly earnings of workers in manufacturing industries increased nearly as much as retail food prices. Wholesale price increases were even greater, while the prices received by farmers increased somewhat less than food prices. Approximately half of the consumer's dollar for food products goes to food processors and distributors and half to farmers. The increase in marketing margins was almost as great as the increase in farm prices.

These facts suggest that the sharp increase in food prices since 1945 has been a part of a broad inflationary trend rather than the result of farm price support programs. Before examining the effects of farm price support programs in more detail, two additional bits of information should be noted—first, food supplies per capita have been maintained at an ample level throughout this period. Food supplies per capita in 1950 were 98 percent of those available in 1945 and 112 percent of those available in 1935-39. Second, there was little change in the net imports (imports minus exports) of food supplies. The net imports for 1945 and 1950 were as follows:

Year	Net imports as percent of total food supplies
1945	3.3
1950	2.1

Extent of Price Support Programs

The following data taken from Commodity Credit Corporation and other Department of Agriculture reports indicate price support operations for farm commodities other than cotton, tobacco, and wool by fiscal years.

Price support operations carried out by CCC loans and acquisition of stocks in liquidation of loans have the effect of strengthening prices when the loans are first made, offset by an equal effect in keeping prices from going above the loan or authorized resale level when current supplies become short, or inflationary pressures develop, as in recent months. From the consumer's point of view, price support programs for storable products tend to stabilize prices and supplies, with increases in some months or

	1946	1947	1948	1949	1950
	(Million dollars)				
CCC loans	160	174	130	1,239	1,495
Increase in inventories	—	—	—	925	1,014
Losses on perishables ^a	^b	74	90	205	137
Surplus removal expenditures: ^c					
Dairy	—	—	—	2	16
Eggs	—	11	20	14	13
Fruits	—	—	20	10	28
Grain	4	—	—	4	3
Peanuts and products	—	—	—	10	5
Tree nuts	—	—	1	—	4
Vegetables	8	27	21	11	5
Total	12	38	62	51	74
Total, CCC losses on perishables and surplus removal expenditures	12	112	152	256	214

^a Primarily potatoes and eggs.

^b Data not available.

^c Primarily purchases for direct distribution to welfare agencies and School Lunch Programs, although a part of the expenditures are for diversion to other than usual market uses or for export subsidy. Funds for these operations are made available from custom receipts (Sec. 32 of the 1938 AAA Act).

years offset by decreases in subsequent periods when the stocks removed from regular market channels are returned to them.

Effect of Price Supports for Perishables

Price support operations involving purchase and diversion of perishable products from regular market channels tend to reduce the temporary overabundant supply of these commodities and increase their market prices. Price support operations of this type varied from \$112 million in 1947 to \$256 million in the fiscal year 1950. In general, they were undertaken when the market price of a particular commodity was unusually low for some temporary reason and tended to support prices at more nearly their normal market level (potatoes being the outstanding exception where the price was supported at a level which encouraged increased production).

A rough measure of the importance of these price support operations on perishables is the amount of money spent on them. The removal from regular market channels of \$112 million of perishable products in 1947 probably increased consumers' costs of these products by \$25 to \$100 million. Consumers probably pay as many or more total dollars for a crop of snap beans 105 percent of normal as for a crop 108 percent of normal. If the government purchases three percent of the crop and distributes it through non-market channels, farmers receive as much or more for the remaining crop plus the value of the government purchases.

On this basis, consumers' retail food costs may have been increased by as much as \$25 to \$250 million annually from 1946 through 1950 by price

supports on perishables. This \$25 to \$250 million annual increase in consumers' food costs arising from government price supports for perishable products compares with a total expenditure at retail for food in those years of \$50 to \$60 billion. Price support operations on perishable commodities, while yielding substantial benefits to a limited number of producers, increased retail food costs less than half of one percent. These price support operations reduce producers' current losses and tend to prevent them from reducing production the following year. The maintenance of adequate production of perishables from year to year, encouraged by price protection to the farmer, stabilizes both agricultural and consumer prices. Stabilized supplies and prices to the consumer more than offset the failure to get even greater bargain prices when crops are abnormally large.

The above analysis was prepared for and released by Chairman Ellender of the Senate Committee on Agriculture and Forestry on May 2, 1951. This differs from the earlier release in the use of data on CCC stocks and relative prices for a more recent date (April, 1951), not available earlier.

WALTER W. WILCOX

Library of Congress

THE USE OF PHYSICAL INPUT-OUTPUT DATA IN PREDICTING DELIVERY COSTS FOR CONCENTRATED FRESH MILK

CONSIDERABLE research effort is being expended on the collection of physical input-output data for various production and marketing processes. Where labor is one of the principal factors involved, the time study has become a common and useful tool. Results of such time studies actually become production functions under given practices and circumstances. These production functions can be quite useful in predicting the impact of a new product upon costs of production or marketing. This is demonstrated by newly developed concentrated fresh milk which has recently been introduced in a number of markets.

Time studies of the home delivery of milk in four Indiana markets indicated four principal methods by which unit delivery costs might be reduced:

1. Delivery of a greater quantity per customer.
2. Delivery to more customers per mile traveled.
3. Increasing labor efficiency by improved methods.
4. Reducing truck costs by various operating economies.

Table 1 shows what amounts to, in tabular form, a production function for the delivery of milk to homes under conditions existing in the markets studied. Mileage of the route and type of customer were the important factors in determining the number of customers served. Variations in the time required to deliver different quantities per customer were not statistically significant.

TABLE 1

NUMBER OF CUSTOMERS WHICH CAN BE SERVED ON ROUTES OF DIFFERENT LENGTHS AND TYPES UNDER CONDITIONS SIMILAR TO THOSE IN FOUR INDIANA MARKETS, 1949*

Hours of Working Time	Mileage of Route				
	1-10	11-20	21-30	31-50	Over 50
Routes with houses close to road:					
7 hours.....	200	165	150	140	110
8 hours.....	235	200	175	165	130
Routes with houses long distance from road:					
7 hours.....	175	150	140	125	100
8 hours.....	210	185	165	150	120
Routes serving apartments:					
7 hours.....	185	160	145	130	105
8 hours.....	220	190	170	160	125

* Source: Operations in Retail and Wholesale Milk Routes, Purdue Agricultural Experiment Station Bulletin 556, November, 1950.

The possibility of decreasing delivery costs by the use of concentrated fresh milk rests entirely upon the first point, delivery of a greater quantity per customer. The claim of the concentrated product is that a one-third quart container of it can be reconstituted to one quart by addition of water, and result in a milk whose flavor and nutritive value are almost identical with those of standard fresh milk. If this is true, then a quart of concentrate would be equivalent to three quarts of ordinary milk.

The real saving in the cost of delivering concentrated milk would come from less frequent delivery. The smaller bulk of the concentrated product would make it possible for the housewife to store a larger supply in the refrigerator. Keeping quality of the product is reported high. If customer acceptance could be obtained, it is reasonable to assume that the concentrated milk might make it possible to reduce deliveries to twice weekly. No particular cost advantage would be obtained if the present every-other-day or three-day-per-week delivery was continued with fewer bottles delivered per customer.

The saving in delivery cost resulting from twice a week delivery compared with present three-day-per-week delivery can be roughly estimated. Consider a dairy having 50 home delivery routes operating 6 days per week. Each routeman serves a total of 350 customers: 175 each on Monday, Wednesday and Friday, and another 175 each on Tuesday, Thursday and Saturday. Thus the dairy has a total of 50 routemen and 17,500 customers. If each customer averages 2 quarts per delivery, or 6 quarts per week, the dairy's total sales would be 105,000 quarts each week.

Assume now that the advent of concentrated milk allowed delivery to be reduced to twice weekly. Each routeman could then serve 525 customers instead of 350. The dairy could thus deliver the same quantity of milk equivalent to the same number of customers each week with only 33 route-

men and trucks. This would mean a saving of 17 regular routemen, probably at least 3 spare routemen, and 17 delivery trucks. At present costs, the dollar and cents reduction in delivery expenses may be estimated as follows:

17 routemen at \$100 per week	\$1,700
3 spare routemen at \$80 per week	240
17 trucks at \$30 per week	510
	<hr/>
Total Saving	\$2,450
Saving per quart on 105,000 qts.	2.3¢

Other possible savings in overhead, etc. have been eliminated here for the sake of simplicity.

If the keeping quality of the concentrated milk proves to be adequate, even once a week delivery is conceivable. This, of course, would result in an even greater saving per quart. The most important point established by the input-output data is that the only real saving in delivery cost which could arise from the distribution of concentrated fresh milk would be through less frequent delivery and thus greater volume per customer per delivery.

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BOOK REVIEWS

The Rural Economy of New England, John Donald Black. Cambridge: Harvard University Press, 1950. Pp. xxiv, 796. \$7.50.

Over a period of years and especially in the last two or three decades, a great deal of research has been carried on throughout the country in the field of agriculture and rural economy in general. Much of it came as a result of the activities of agricultural experiment stations in individual states, and some through the efforts of the United States Department of Agriculture on an independent or cooperative basis with other agencies. As one of the older sections of the country, New England has had its full share of the research material dealing with various phases of agricultural and rural problems. Out of the welter of this material and also from some data obtained through his own investigations, Dr. Black, by painstaking and critical analysis, has succeeded in his book in developing a picture of New England rural economy that for its completeness and thoroughness exceeds anything that has appeared so far in the studies of this region, or, for that matter, any other region of the country.

The concept of rural economy as developed in this study is taken to mean land use economy. To this end, consideration is given to land use in farming, as well as to a multiplicity of other land uses that characterize rural areas of New England. Professor Black places special emphasis on the analysis of operating units in various types of land utilization, although because of the character of the information available, it is only in the farm management analysis that he succeeds in following this procedure to a high degree of completeness. It might be added that large areas of land in New England, especially forest areas, are not now in operating units; and the units for some other types of land use, particularly in the field of recreation, are rather vague and do not lend themselves to a very definite analysis. Nevertheless, this method of approach is very fruitful, especially in outlining the potential developments under proper land policies and land management.

The first 16 chapters of the book are given to the consideration of the general background and to various factors which have had an effect in shaping the character of rural areas in New England. This includes the analysis of physical factors, like soil, topography, and climate, as well as of socio-economic factors relating to industry, trade, transportation, and trends in rural population. The treatment of land use history and the evolution of agriculture in New England is of special significance; in this section, through a critical analysis of the census figures on agriculture, and on the basis of data brought out from his own and other studies, the author works out proper adjustments which help to give a more truthful picture relating to the course of developments in New England agriculture

over a period of years. Likewise, the author's extensive acquaintance with research material and with existing conditions in rural economy, not only in New England but also in other sections of the country, enables him to bring out a number of comparisons which help the reader to visualize the relative position of the New England region in a more realistic perspective.

Out of a total of 36 chapters in the book, some 10 are devoted to the consideration of individual products raised on New England farms, including the analysis of production, marketing, and prices. The discussion of alternative possibilities in the use of land and in general farm practices on various types of "representative" farms provides a good basis for understanding the nature of the problems which New England agriculture is facing, and at the same time outlines the policies and practices needed for better adjustment and future progress. An excellent analysis of desirable farm management practices is, however, overloaded in some sections with too many technical details which are generally available in specific farm management studies devoted to the particular subjects. This is especially true in the sections dealing with the rates of livestock feeding, poultry housing, and control of disease, to the extent that they do not refer specifically to New England conditions.

After tracing the evolution of New England agriculture through its successive historical stages, Dr. Black comes to the conclusion that

... the great retrogression that set in before the Civil War began leveling off soon after 1920 and probably reached its limit in the 1940's. . . . The remaining disadvantages of the land in New England are not enough to outweigh the advantages of position of most of the land now in agricultural use, and even a little not in such use.

While agriculture is just about rounding the corner, and residential and recreational uses of land in rural areas have been for some time in vigorous growth, the forestry of New England, according to the author, will require a few more decades of readjustment to fit into a balanced system of land utilization for the region.

Throughout the volume the discussion is accompanied by a profusion of tables and charts, some of them ingeniously contrived for more vivid presentation of various economic and other data as they relate to different sections of New England.

In addition to being a fine piece of research work, this volume is a veritable encyclopedia on New England agriculture and land use developments in its rural areas. It should become a *sine qua non* for reading and study for anyone concerned with rural problems of the region, whether engaged in research, teaching, organization, or administration of programs dealing with various phases of agriculture, or rural land utilization in general.

It will be also valuable source material for teachers of agricultural economics, land economics, and land policies in providing a good demonstration

of the application of research methodology to the study of complicated problems of interrelationship arising from the use of land in rural areas under New England or similar conditions.

DAVID ROZMAN

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The Nineteen Fifties Come First, Edwin G. Nourse. New York: Henry Holt and Co., 1950. Pp. 184. \$2.00.

Announcement of this book coming so soon after the author's resignation as Chairman of the Council of Economic Advisers naturally whetted the anticipation of readers who wanted "inside information" regarding his differences with the President. However, this is not a "grudge" book. Those who know Dr. Nourse knew it would not be. Others who may pick it up looking for "revelations" will soon forget their disappointment in the lucid and reasoned treatment it accords pressing economic problems of the day. The author's philosophy is illustrated by his observation in the introduction that "the economist-citizen must keep faith with his principles rather than 'follow the party line.'"

The title given the book is made clear in the opening chapter, where it is pointed out that decisions we make now and in the next few years will play a leading role in deciding our future. The author is concerned about those decisions. He refers to the growth in organized strength of labor, agriculture, and management. He observes that "The danger in group power is high-lighted by the fact that each of these interest groups—workers, farmers, businessmen—when it craves something bigger or faster than its members can get through the power of private organizations, shows an increasing willingness to turn to government as the agency to give it to them." He warns that groups grasping for power may create a "Frankenstein" in the form of governmental control. He, therefore, places much emphasis on self-discipline.

Against this backdrop, he presents in separate chapters reviews of developments in agriculture, labor, and business. Group leaders and citizens generally will do well to review dispassionately the points covered in this analysis.

Two chapters concentrate on inflation, its dangers and curbs. Again the spotlight focuses on the importance of accepting responsibility associated with power. Another chapter deals with militarism and our national life. The final chapter bears the intriguing title "Was 1950 Our Lost Weekend?" It examines steps taken and those which need to be taken in the situation which confronts the nation today.

The book is intended for the intelligent, serious reader. It does not present a series of dogmatic conclusions for acceptance or rejection. Instead it reviews fundamentals which citizens need to recognize in arriving at judg-

ments. The author has drawn upon his excellent command of language in providing a most readable and clear treatment. This book deserves all of the attention it is receiving and more.

O. B. JESNESS

University of Minnesota

Agricultural Market Prices, Warren C. Waite and Harry C. Trelogan. New York: John Wiley & Sons, Inc., Third Edition, 1951. Pp. vii, 430. \$5.25.

Although many departments of agricultural economics teach a course called agricultural prices, the subject is by no means clearly defined. It is not distinct from marketing, for any realistic description of farm price determination must refer to the setting in which prices are made. It is closely related to equilibrium theory, since prices are the focal point of an analysis of a competitive market economy. It can hardly ignore the dynamics of our economy and perforce touches on the area of business cycles, monetary theory and the like, and usually something on statistical methods needs to be included. What to put in a course on agricultural prices and how to relate it to other subjects taught in the department is a major problem for the instructor.

Messrs. Waite and Trelogan, I think, have selected the right guiding principle in writing this text for a course in agricultural prices. They concern themselves primarily with *variation* in prices of farm products both through time and in markets at any given time. They correctly contend that variation is the most important characteristic of prices from the standpoint of entrepreneurial decisions, and they might have added that price change is so dramatic and pervasive that many students require some explanation of it before they are content to proceed to other aspects of price. The authors confine themselves largely to principles having fairly general application to prices of farm products, and when they go into detail about the marketing or other aspects of a particular commodity they do so only for purposes of illustration.

Topics related directly to price variation include the general price level, price flexibility, demand for and supply of farm products, prices in related markets and for different grades and varieties, prices at successive stages of marketing, and seasonal variation of prices. Price formation is introduced with the conventional supply-demand cross, and this is followed by an excellent little discussion of the influence and importance of dealers' reactions. There are descriptions of futures markets and of the pricing of factors of production, and the book closes with chapters on price control and price policy. An appendix on methods of price analysis deals in simple terms with index numbers, computation of trend and of seasonal indices, and derivation of demand curves.

The book makes considerable use of the simpler economic models conventionally used in equilibrium analysis. The cost structure of a firm operating under pure competition, equilibrium for a monopolist and for a monopsonist, diagrams for situations of price leadership and the like are presented. These will be helpful to students at ease with the diagrams, but they will be difficult for the non-specialist. This brings up the familiar conflict between teaching a course for majors and teaching it for students from other curricula. The ideas presented in this book are rather elementary and their comprehension does not really require much previous training in economics on the student's part, but they can be made inaccessible to him if cloaked in forms which, however useful for other purposes, are not essential to the end at hand.

I have treated this book as a text in agricultural prices. Others may protest that it is a text in general marketing. This is largely a matter of how departments divide subject matter among courses, however, and of the tags they choose to place on them. In any event, a very satisfactory course may be built around this book. The treatment of all subjects is thoroughly competent; this last contribution from Professor Waite is worthy of him. Much evidential and illustrative material is included, and the writing and makeup of the book should be attractive to students.

The first edition of this book was in offset form and carried the title *Introduction to Agricultural Prices*. The general structure of the first edition has not been changed, but several chapters have been considerably revised. References and study questions (does anyone use them?) have been added at the close of chapters, and all statistical procedures have been moved to the appendix at the end of the book.

G. E. BRANDOW

The Pennsylvania State College

Inflation in the United States, 1940-1948, Lester V. Chandler, New York: Harper and Brothers, 1951, Pp. xi, 396.

This volume appears at a most opportune time. The Nation is again wrestling with an inflation problem associated with the diversion of resources from civilian to military uses. There has been a real need for a scholarly study of the experience with inflation during and following World War II. If written for distribution outside professional circles, such a study could make an important contribution to public understanding of the problem and the methods for dealing with it. Professor Chandler's latest book goes a long way toward filling this need.

The author has set out to describe the process of inflation between 1940 and 1948 and to analyze the public and private policies that produced it. He has succeeded in doing a reputable job. The relevant questions have been asked; in most instances it appears that the answers are essentially

correct. The analysis is supported by a wealth of statistical information which makes the book a handy source of data for those who cannot spare the time to consult original sources.

The dynamic role of fiscal-monetary policy in producing the rise in prices is effectively presented. Under the wartime tax and voluntary savings programs, the collections from the current income stream were insufficient to meet the Government's need for funds. This led to the sale of securities to the banking system and an increase in the quantity of money. The expenditure of the newly created money went to swell private incomes, which in turn raised the demands for goods and services relative to available supplies. Increased private spending during the war, however, was held in check to a surprising extent by the imposition of direct controls which diverted a large proportion of the increase in money income into liquid savings. As a consequence, a significant part of the effect on private spending was postponed until after the termination of price controls.

Professor Chandler clearly explains how wartime monetary policy was dominated by the fiscal requirements of the Government. Only minor importance is attached to the low level of interest rates as a factor in the wartime rise in prices. This view appears to be justified, since direct controls not only encouraged a high rate of savings but they also limited the rate of private investment.

Fiscal policy played a negative role in the development of the postwar inflation. During the greater part of the period the cash budget showed a surplus. The deflationary tendencies of this, however, were more than offset by events in the private sector. An upward shift in the propensity to consume, the high level of current income, the accumulation of liquid assets, and the expansion of bank and book credit were the principal factors in the upsurge in consumption spending.

On the investment side, high profit margins, the large accumulations of wartime profits, and the Government's policy of maintaining low interest rates helped to push investment spending to record levels. The author attaches considerable importance to the increase in money wage rates as a cause of the postwar price rise. In addition, a significant increase occurred in gold imports which expanded the money supply and added to the spending stream.

From the vantage point provided by ex post analysis, the author outlines a number of changes which he feels should have been made to increase the effectiveness of the anti-inflation program. The points are well known to economists.

While Professor Chandler presents a strong case for an increase in effective tax rates, he does not believe that the Government's wartime budget should have been balanced. He feels that balancing the budget would have adversely affected incentives. The empirical evidence is quite inade-

quate, but undoubtedly in practice there is something to this argument. Once full production is achieved, however, it is difficult to see how the aggregate real cost of diverting resources to military purposes can be lessened by paying out the same amount of dollars to buy a smaller residual quantity of civilian goods. The question is closely related to the debate over the role of money wages and real wages in determining the supply of labor.

The author believes that a program of compulsory savings should have been substituted for voluntary savings. There are important reasons to support this view. From the standpoint of the saver, it doesn't have the finality of a tax increase. If control can be maintained over the time distribution of claims, it could be an effective device for helping to stabilize future aggregate demand. But it does have serious political weaknesses.

With respect to monetary policy, Professor Chandler favors a program that would have regulated the monetization of the public debt, involving control over the purchases of government securities by the banks and requiring banks to maintain a 100 percent reserve against all deposits above a certain base level. In addition, he effectively argues for an increase in postwar interest rates within a general framework of orderly conditions in the money market.

While full credit is given to the role of direct controls as the major bulwark against inflation during the war, he warns against the view that they are an adequate substitute for a sound fiscal-monetary policy. In the absence of a realistic fiscal-monetary policy, he takes the view that direct controls should have been retained for a longer period after the war. There is certainly ample evidence to support this position. But it would have required an effective program of public education in order to change the temper of opinion favoring a quick return to a free economy.

Agricultural economists should find this book interesting and profitable reading. It should be most helpful to extension workers involved in public discussions of the inflation problem. Perhaps the greatest contribution the book can make is in fostering a greater public understanding of the task of inflation control.

DON KALDOR

Iowa State College

Defense Without Inflation, Albert G. Hart. New York: Twentieth Century Fund, 1951. Pp. xiv, 186. \$2.00.

This book is the first of a projected series of at least four. The others to follow will deal in greater detail with the problems of (1) budgetary policy, (2) monetary and fiscal problems and (3) controls to deal with shortages. Mr. Hart does an excellent job of pointing out some of the problems that need to be taken into account in any mobilization program. He does not.

however, indicate the person or agency that he expects to solve these problems.

After a discussion of both the bad and good points of inflation, the author concludes that an inflation of two or three percent a year during a period of stress would not be too bad. He suggests that an inflation of over five percent a year must be taken to register a serious default of government in its job of sorting out the more urgent claims on output from the less urgent.

This book is mainly concerned with the effects on the economy of what is called a strategy of readiness. It is pointed out that in case of all-out war we would go immediately into full mobilization. However, the author feels that it is more probable that we are entering a prolonged period of international tension which will result in only partial mobilization. During this time we shall (1) get set so that full mobilization can be carried out in a few months rather than the traditional two or three years and (2) create enough ready strength so that no surprise could deprive us of those few months.

During the next few years the author sees a hump in military preparedness and a trough in production available for civilians. This results in shortages and inflation unless adequate anti-inflation measures are taken. Direct control measures, such as wage and price control, are discussed. It is pointed out that they can be useful, but that they merely repress inflation and do not close the inflationary gap. Hart points out that such controls tend to wear out. Since this promises to be a long struggle, we must guard against subjecting them to heavy strain too early in the game.

Budgetary policy is discussed and the possibilities of increasing different kinds of taxes are examined. Personal income tax increases seem to offer the greatest possibilities of reducing the expected federal deficit in 1952. Since future expenditures are doubtful, the author suggests a flexible tax policy under which taxes might be refunded during the year if expenditures were not as large as anticipated.

A monetary policy consisting of qualitative control of various types of loans and quantitative control of bank credit and reserves, redemption and sale of government securities, and currency arrangements is also advocated as a means of controlling inflation. The author points out that thus far we have only barely begun to fight inflation along monetary lines. We have many more weapons as yet unused.

Hart believes that during the next two or three years it will be good policy to aim at a mild disequilibrium or have a slight excess of demand. He feels that taxes and monetary policy are clearly capable of narrowing the margin of excess demand to any desired degree at any rate of military outlay in sight for the coming year. If price and wage controls are to be effective, they must be supported by whatever it takes to make them work. Technically this means rationing, control of the flow of supply to keep it in ration

channels, effective legal prosecution of price control and rationing offenders. It also means economy in government outlays, much higher taxes and a tight monetary policy. The public must be willing to look realistically at problems instead of relying on the formula of "let's pass a law." We must also find a formula which will subordinate group interests to a workable stabilization compromise.

The last chapter of the book deals with "Policy for the Crisis" prepared by a committee consisting of J. M. Clark, Chairman, T. W. Schultz, A. Smithies, and D. H. Wallace. The committee report embodies inflation control mechanisms which are very similar to the recommendations made by Hart in other parts of the book. The main conclusions and recommendations are as follows:

1. Retain as much as possible of the market operation of the economy.
2. Adopt procurement and allocation policies which promote efficiency.
3. Increase taxes—balance budget.
4. Adopt monetary and credit policy to control inflation.
5. Use limited wage and price controls—combined with the use of the indirect controls.
6. Rationing—used only where shortages are severe.
7. Increased size and coverage of the social security program.
8. Economy in government—possibilities not as large as sometimes indicated, but some cuts can be made.

In general, the authors have advocated the customary inflation control measures which have been mentioned time and time again. The real problem seems to be to get these measures adopted and put into effect. Tax increases, for example, have always proved difficult to put across politically and the present seems to be no exception. Apparently, the economists' recommendations need to be tempered by what is politically acceptable if they are going to be a service to the country. This book does an excellent job of setting forth *what* should be done to have defense without inflation. It does not, however, tell *how* this can best be accomplished.

DALE BUTZ

Michigan State College

Agricultural Marketing, Adlowe L. Larson. New York: Prentice-Hall, Inc., 1951. Pp. xiv, 519. \$5.25.

This book is a general agricultural marketing text, well adapted for teaching students with no previous training in marketing at the sophomore-junior college level. There are six major sections. Part I is a general discussion of the market for agricultural products, agricultural production, and the goals and general characteristics of the marketing system. Part II, "Agencies in Marketing," describes the different kinds of agencies which

operate at local, wholesale, and retail levels, and something of trade channels. Part III describes and develops the general principles of performance of the following functions: buying and selling, risking, financing, storage, transportation, and standardization. Part IV consists of four commodity chapters: grain, cotton, livestock, and dairy products. Part V, "Pricing," describes in two chapters the standard theory of price and price variations, competition, monopolistic competition, monopoly, and monopolistic tendencies in agricultural marketing. Part VI, "Problem Areas," pulls together the major aspects of marketing not covered earlier. Chapters in this section are: "Interregional and International Trade Barriers," "Cost of Marketing," "Marketing Information," "Futures Trading," "Agricultural Cooperation," "Marketing Research," and "Agricultural Marketing Policy."

Professor Larson has done an excellent job of reducing the large amount of marketing material to its central considerations and adapting these to the teaching of a one-term course in agricultural marketing. The text is an orthodox and well-balanced treatment of the subject. General description and specific information are blended so that the underlying principles are clearly established. The language is simple and clear. It is the kind of text that students will read and approve.

The treatment of the marketing functions is the best of its kind that I have seen. It presents a clear picture of the marketing processes and develops from this the economics of the different functions. The treatment of risking is not as thorough as might be desirable, but in view of the generally limited knowledge of risking, it is a credit to Professor Larson's knowledge of the subject that this chapter is included and given a prominent place.

The main criticism of the book is organizational. The first three sections develop background for the commodity chapters. The pricing section forms a logical part of this background and should precede the commodity chapters. The last part is composed of aspects of marketing that do not fit the organization of the book. Most of them are a part of the background for commodity chapters and should be integrated into earlier sections. For example, futures trading should precede grain marketing as it is part of the pricing system for grain. "Cost of Marketing" could well be the concluding chapter in Part I. "Agricultural Cooperation" should precede the commodity section. "Marketing Research" and "Marketing Policy" are well left to the end of the book.

As is true of any work of this scope, arguments of detail can be raised. Most of these are omissions rather than disagreement. The pricing part is weak in description and includes too much discussion of monopoly. The grain marketing chapter concentrates too much on wheat and Oklahoma conditions. The futures trading chapter does not reach very clear conclusions about the effect on prices. The policy chapter could be tied closer to marketing. While mentioning classification price plans for milk, the dairy

chapter misses an opportunity to develop the principles of an interesting pricing system and to illustrate the role of prices.

It is doubtful that much use of the marketing research chapter will be made in teaching. It seems to be directed at teachers rather than students. For this purpose it is a concise and useful statement.

T. A. HIERONYMOUS

University of Illinois

Agrarian Socialism, S. M. Lipset. Berkeley and Los Angeles: University of California Press. 1950. Pp. xvii, 315. \$4.50.

The complete title is *Agrarian Socialism—The Cooperative Commonwealth Federation in Saskatchewan—A Study in Political Sociology*. The book represents the results of a rather intensive study into the nature and causes of the agrarian socialism in the Province of Saskatchewan. There the Cooperative Commonwealth Federation (CCF), with avowedly socialist aims, has been twice elected to power in the legislature, the only occurrence of this kind on the North American Continent.

The study is based on an apparent paradox: On the one hand, Lipset says, is the widely held view that (1) radical movements have their origin in, and are led by, chronically destitute malcontents and crackpots from the marginal parts of our population, and (2) that farmers, especially commercial farmers, are inclined to be conservative and independent. On the other hand is the fact and reality of the CCF in Saskatchewan, led and supported more often than not by rural middle-class folks who have achieved social and economic status in their communities. Lipset's purpose is "... to show how a radical agrarianism emerged as a direct and logical expression of the problems of the Saskatchewan wheat economy" (p. 36).

In Chapter I the author discusses some of the history of radicalism in the United States, showing how it has at times occurred in the Great Plains where it was associated with the high-risk wheat areas; for instance, the Greenbackers, the Populists, and the Non-Partisan League in North Dakota. In Chapter II, the social and economic setting is given. Lipset describes the various factors that make Saskatchewan (in many respects like other wheat areas) unique, showing how the chief motivating stimulus for the protest movements has been the severe economic and climactic vulnerability of a one-crop wheat economy.

Chapters III through VII consist of an interesting chronicle of the history and developmental struggle of the agrarian movement in Saskatchewan from settlement days to the present, from the earliest protest organizations through cooperative self-help and political action to the present-day CCF. Accompanying this is an analysis of the evolution of the agrarian ideology and program. It is also compared with the shaping of events in the neighboring and similar areas of Alberta and North Dakota.

In Chapters VIII, IX, and X, Lipset relates the development and achievements of the CCF functionally to the various factors of social and economic status and to the factors that make Saskatchewan a unique and logical basis for such a radical development. He presents considerable empirical data in support of his hypothesis that the movement was led and supported by leading citizens of the rural communities.

The author attempts an appraisal of how radical or socialistic the work of the CCF government in Saskatchewan has been. Compared with orthodox socialism, he finds it lacking in many respects, though it is by far the most radical government in Canada. Its constitutional limitations, its lack of enough doctrinaire socialists, its desire to retain electoral support, its inevitable bureaucracy, and other practical considerations of office, have removed much of the socialistic fervor and have produced many compromises. He finds that the CCF as a functioning government is not a true socialist movement but a social reform movement. It should be noted, however, that in the Canadian context the CCF appears more radical than in the American context, as Canada had practically no reform of the New Deal type during the depression. Lipset states that in the United States agrarian radicalism was headed off by the New Deal with price supports, crop insurance, and social security (pp. 17 and 119).

Some of the major pieces of legislation are discussed in Chapter XI, and Chapter XII contains a review of the bureaucratization of the government. The CCF government has passed rather strong farm security legislation, and has promoted income stability through establishment of seed and fodder banks and continual pressure on the Federal Government for farm price supports. However, it has no intention of socializing land, and the only equalitarian proposal in agriculture has been some experiments in voluntary cooperative farming.

The social service program is considered the best in Canada. Medicine has "... became a most completely socialized system ..." (p. 238) but the medical profession has forced the government to compromise to the extent of paying doctors on a fee-for-service basis rather than on a salary basis.

Saskatchewan has no large-scale industry, and the principal enterprises socialized are electric power, telephones (telephones and some electric power had been socialized before the CCF took office), bus lines, some types of insurance, and a dozen or more smaller enterprises for processing Saskatchewan resources. The CCF government has passed "... the most pro-union legislation in the democratic capitalist world" (p. 230), but has failed "... to make innovations in the social structure of the factory ..." (p. 236).

Added to this are the achievements of the agrarian movement through cooperatives. Saskatchewan has the largest cooperative movement on the continent and the largest cooperative elevator system in the world. Co-

operatives are prominent in many types of enterprises; for example, oil refining and distribution, flour milling, farm machinery, creameries, and general country stores. There are four times as many cooperative memberships in Saskatchewan as there are farmers (p. 227).

There is an error on page 201. To illustrate the sparsity of settlement, Lipset states that, "The rural municipalities, the local government units, contain less than 400 families, and each municipality (about 18 square miles in area) contains a number of distinct communities." This does not make it appear very sparse. Actually, a typical municipality is 18 miles square (not square miles), making it really 324 square miles in area, and so is indeed sparsely settled.

In the epilogue, Professor Lipset speculates on the future of agrarian socialism and the CCF in Saskatchewan. He believes, "They have probably gone about as far as a sectional agrarian group can go within geographic, economic, and constitutional limits to establish direct producers' control over their economy" (p. 277). Although he expects farmers and others to become less radical when they have achieved their immediate economic reforms (judging by experience in other countries) this will not necessarily mean a return to the more conservative parties. It is more likely, he thinks, that the once radical CCF will be institutionalized and will become more and more a normal and integral part of society.

Agrarian Socialism is a very interesting book. The study appears to have been competently planned and executed. It is meticulously annotated and supporting data are plentiful, although to this reviewer, it is regrettable that the footnotes have been relegated to 22 pages at the rear of the book.

PHILIP J. THAIR

Bureau of Agricultural Economics

Food Marketing, edited by Paul Sayres, New York: McGraw-Hill Book Company, Inc., 1950. Pp. xii, 335. \$5.00.

Food Marketing "is an effort," to quote the editor, "to separate the vast and complex [food and grocery marketing industry] into its fundamental working parts, to describe them accurately, and to establish their relationships among each other and to the whole industry." *Food Marketing* is not a compilation of previously published papers; rather, it is a series of essays which give substance to the editor's well planned outline.

The 22 authors are particularly well suited for the job given them by the author. Most of them are presidents, vice-presidents, sales managers, or chairmen of the boards of their respective companies. Only four authors are employed by trade groups.

The book has seven parts. Part I, "Introduction," is a general description of the magnitude of the food marketing industry, written by the editor.

Part II, "40 Million Housewives Can't Be Wrong," includes three papers on mass marketing and self-service in retailing. It presents the place of the

national chains, independents, and the super-markets in this new way of marketing.

Part III, "Room for Everybody in Retailing," includes five papers which show how different marketing agencies find a place for themselves in the over-all food marketing system. Regional chains, retailer-owned wholesalers, voluntary wholesale or cooperative chains, wagon route selling, and company or industrial stores are discussed.

Part IV, "New Jobs for Service Groups," is perhaps misnamed. It discusses three marketing groups, the wholesaler, food broker, and especially salesman, and shows how they contribute to an efficient marketing system. Then, as though there were no logical pigeonhole for it, the place of sound personnel programs in marketing firms is set forth.

Part V, "National Brands Go to Town," could very well have been entitled "How To Make People Buy a Product." This is one of the best sections of the book, since it bears little or no resemblance to the conventional marketing text's functional or institutional approach. The authors of this section realize that the most important step in marketing is the sale to the ultimate consumer. Methods of stimulating sales through display, advertising, public relations programs, correct packaging, quality control, and special merchandising schemes are discussed clearly and honestly.

Part VI, "Today's Marketing Frontiers," deals with fresh fruit and vegetables, meats, and frozen foods.

Part VII, "Conclusion," is a summary by the editor. Also, the editor makes some predictions for the type of food markets we can expect in the future.

The authors have done an excellent job of explaining mass marketing and some of the ways of doing business with such a system. Few of the authors, however, are critical of their own phase of marketing. A notable exception is Mr. Alber's essay on super-markets. He notes, for example, that supers have generally failed to adopt a good training program and that a super-market is not an easy place for children to shop.

The greatest weaknesses of *Food Marketing*, in the reviewer's opinion, are the discussions on marketing fresh fruits and vegetables and meats. Only two chapters are devoted to these groups, although they account for about 40 percent of the consumers' food dollar.

The discussion of fresh fruit and vegetable marketing contains little that is new. It is the traditional discussion of the low share of the consumer dollar going to producers; high perishability of the products; large transportation charges involved; and poor facilities, especially at the wholesale markets, for handling the products. The only concrete hopes given for improvement in marketing are educational programs by trade organizations and promotion of particular commodities. Little mention is made of problems in retailing fresh fruits and vegetables.

The chapter on meat marketing is largely devoted to praising the meat packing industry for its low costs. The efficiency of the industry is "proved" by citing net earnings per pound dressed weight rather than dollars earned per 100 dollars invested. Almost no mention is made of retailing meats. The problem of self-service retailing of meats is ignored.

It seems unfortunate that the editor chose men from trade and farm groups rather than actual marketing men to discuss meat and produce marketing. It would have been more consistent with the rest of the book had he called upon sales managers of wholesale and retail establishments to discuss these problems.

Food Marketing is a work of love and duty. It is a nonprofit venture with all royalties going to educational grants in the field of food marketing. It is commendable that men of the caliber of the authors should devote their time to such an effort. *Food Marketing* is a worth-while contribution to the literature on marketing. One wishes that more marketing books were written by men who do marketing.

S. T. RICE

University of Delaware

Farm Law in Wisconsin, J. H. Beuscher, Appleton, Wisconsin: C. C. Nelson Publishing Company, 1951. Pp. x, 388. \$4.00.

This book should provide both profitable and entertaining reading for those who are interested in the legal side of farming. Although, as the title implies, the author limits himself mainly to Wisconsin law, the book should hold considerable interest for many readers outside the state, particularly those in the Central States Region.

Persons who are especially interested in the problem of transferring ownership of the family farm, or in other aspects of farm acquisition and transfer, will find the book particularly rewarding. Roughly half of the text is devoted to such subjects, including land contracts, mortgages, wills, and laws of descent. A discussion of farm leases and father-son farm operating agreements is also included. The remainder of the text is given over to such topics as how and by whom law is made, secured and unsecured farm debts, taxation, boundaries, fences and water rights, and such state and local regulatory measures as milk-control orders and ordinances, rural zoning ordinances, and drainage districts. The author has chosen not to discuss in detail the multitude of federal laws and regulations affecting farmers.

Professor Beuscher treats his reader to a fresh and clear presentation of a difficult subject and has included several helpful examples and illustrations. The text is augmented by an appendix which includes, among other things, a number of legal forms. The author discusses those legal problems that from his own experience seem most often to puzzle farmers.

This experience includes membership in the Wisconsin Bar and a Professorship of Law at the University of Wisconsin, where he heads a research program entitled "Law in Action." The book was written primarily for students in his Farm Law course in the College of Agriculture, but the author also had in mind the needs of teachers and students of vocational agriculture, agricultural extension workers, and interested individual farmers.

The content of the book quite naturally reflects the author's Wisconsin background. For example, his chapter on farm leases is only 12 pages in length; but as the percentage of farm tenancy in Wisconsin is relatively low, this rather short treatment of the subject is probably justifiable. It would not appear to be adequate, however, for readers in states having a relatively high percentage of tenancy.

Farm Law in Wisconsin also includes a number of provocative suggestions. Among these is the suggestion for a uniform statutory foreclosure procedure applicable to both land contracts and mortgages.

HAROLD H. ELLIS

Bureau of Agricultural Economics

Readings in Rural Problems, V. V. Sayana. Delhi, India: S. Chand & Co., 1950. Pp. vi, 184. Rs. 5/—.

Dr. Sayana is Lecturer in Agricultural Economics at the University of Bombay in India. He describes this book in his preface, "Some of the important papers contributed by me on different aspects of Indian agriculture in various journals during the last two or three years are revised and presented in this little book." They cover a variety of topics: teaching and research in agricultural economics, pressure of population on agriculture, taxation of agricultural land and income, land colonization, land values, mechanization of agricultural production, minimum wage legislation and collective bargaining in agriculture, marketing of agricultural produce, consequences of inflation on the agrarian economy, forests and forestry policy, food and agricultural policy. The book is focused on economic and social problems of Indian agriculture. However, the author draws on his comprehensive knowledge of agricultural conditions in other countries and makes frequent reference to research studies and agricultural programs in Europe and the United States.

Dr. Sayana is concerned with finding ways of improving rural living conditions in India where rural people make up 87 percent of the total. He recognizes that this will require modification of institutional arrangements affecting education, health, land ownership and tenure, conservation of soil and forest resources, pricing of farm products, and many other fields. He is not hesitant about expressing his views with regard to the kinds of measures needed to bring about improvement. His recommendations are

based on detailed observation and study, using the methods of a well trained social scientist. But the extent to which it is possible to make positive suggestions for reform is limited by the paucity of facts relating to many aspects of the agricultural economy. In his opening chapter on scope and method, Dr. Sayana proposes to do something about this. He advocates an expanded program of work, not only in agricultural economics, but also in the other rural social sciences.

This book deserves the attention of all who are interested in the possibilities of raising living standards in densely populated areas of the world. Consideration is given to improved methods of agricultural production, better land tenure arrangements, and adjustments in other social institutions. To my knowledge, it is the best single source of information about the rural economy of India.

R. P. CHRISTENSEN

Bureau of Agricultural Economics

NEWS NOTES

Wells M. Allred received his Ph.D. degree at Cornell University in June and has accepted an appointment as assistant professor at Utah State Agricultural College.

Sidney J. Armore has transferred from the Bureau of Agricultural Economics to the National Production Authority.

Antoine Banna has transferred from the Bureau of Agricultural Economics to the Office of Price Stabilization.

Lloyd Barber has transferred from the Bureau of Agricultural Economics to the Institute of Inter-American Affairs.

George W. Barr is on a year's leave of absence from the University of Arizona as Regional Economist, United Nations Economic and Social Council, stationed at Santiago, Chile.

Richard Been has resigned from the Bureau of Agricultural Economics to join the staff of the Brookings Institution.

Wayland Bennett, Assistant Professor of Agricultural Economics at Texas Technological College, is on leave to pursue graduate study at the Louisiana State College.

James O. Bray has been appointed Assistant Professor of Agricultural Economics at Kansas State College to succeed Professor Raymond Doll, who is now Agricultural Economist for the Federal Reserve Bank in Kansas City.

C. B. Brotherton, Assistant Professor of Agricultural Economics at Montana State College, has been recalled to active military duty in the United States Air Corps, where he holds the commission of First Lieutenant.

W. D. Buddemeier has been granted a six-months' sabbatical leave of absence from the University of Illinois and will pursue graduate study at Iowa State College.

Cecil Curtis Cable, Cooperative Agent, Bureau of Agricultural Economics and the University of Arkansas, is on leave to engage in graduate study in the Department of Agricultural Economics, University of Minnesota.

Extra copies of six volumes on the Central Valley Project are still available upon request to the Regional Director, Bureau of Reclamation, Sacramento, California. The titles are: Problem No. 6—Reconversion of War Industries; Problem No. 7—Further Stages in Development; Problems Nos. 8 and 9—Allocation of Costs; Problems Nos. 10 to 13—Payments to Beneficiaries; Problem No. 23—Recreational Administration; Problem No. 24—Economic Effects.

R. Lee Chambliss, member of the staff, Department of Agricultural Economics and Rural Sociology, Virginia Polytechnic Institute, is on leave to do graduate work at the University of Minnesota.

Kent S. Christensen, who has been at Utah State Agricultural College as assistant professor, is returning to Cornell to continue graduate study.

Howard Conklin was appointed Associate Professor of Land Economics at Cornell University.

L. C. Cunningham was on leave from Cornell University from January to April to serve as Consultant in the Grain Branch of the Food Division of the OPS. He returned to his duties at Cornell May 1, 1951.

Rex F. Daly has transferred from the Division of Marketing and Transportation Research to the Division of Statistical and Historical Research, Bureau of Agricultural Economics, as Head of the Demand and Price Section.

L. B. Darrah, recently appointed Professor of Marketing at Cornell University, was on sabbatical leave during the fall term and worked with the Poultry Branch of PMA in Washington, D. C.

Herrell F. Degraff has recently received appointment to the H. E. Babcock Memorial Professorship in Food Economics at Cornell University's School of Nutrition. Professor Degraff will remain on the staff in the Department of Agricultural Economics to continue research and to supervise student research.

Wayne Dexter has been appointed Secretary of the Outlook and Situation Board in the Bureau of Agricultural Economics.

Ralph Eastwood, who completed his doctorate at Cornell University this spring, has been for the past year Executive Secretary of "Milk for Health," the milk promotional organization recently inaugurated in New York State, and is now returning to his position with the G. L. F. Egg Marketing Service.

Walter Ebling, State Statistician of Wisconsin, received a Distinguished Service Award at the recent award ceremonies of the U. S. Department of Agriculture.

Dr. Ernest Feder has received a promotion to the rank of Associate Professor of Agricultural Economics and Associate Economist at South Dakota State College.

Karl A. Fox has been appointed Head of the Division of Statistical and Historical Research of the Bureau of Agricultural Economics.

Orville J. Fuqua, formerly with the Division of Land Economics, Bureau of Agricultural Economics, at Portland, Oregon, has joined the Production and Marketing Administration staff at Berkeley.

Karl Gertel, of the Washington office of the Division of Land Economics, Bureau of Agricultural Economics, is on a year's leave of absence for graduate work at Iowa State College.

O. B. Hardy, for many years a public servant in the State of Oregon, and most recently Extension Livestock Marketing Specialist, died in May.

Van B. Hart has been on sabbatical leave from staff duties at Cornell University since February. He is working with S. W. Warren on a revision of the *Farm Management Manual*.

Omer W. Herrmann, formerly Assistant Administrator of the Agricultural Research Administration, the Department of Agriculture, has been appointed by the Department of State to head the agricultural work at the American Embassy in Paris.

V. Webster Johnson has transferred from the Bureau of Agricultural Economics to Food and Agriculture, Economic Cooperation Administration, to assume leadership of their work in connection with land reform programs throughout the world.

Robert C. Jones will spend the summer in Ecuador as a Community Development Consultant for the Technical Assistance Administration of the United Nations.

Clyde R. Keaton, Extension Economist in Marketing, University of New Mexico, was enrolled in the Graduate School, the University of Minnesota, during the past summer.

Ian F. Keith, Aberdeen, Scotland, who has been pursuing graduate studies in agricultural economics at the University of Minnesota during the past two years, has been appointed assistant professor at the University of Manitoba.

M. Slade Kendrick, of Cornell University, will spend the summer with the National Bureau of Economic Research in New York City, making a historical study of federal expenditures.

Edward E. Kern, Jr., of Mississippi State College, will be on leave to do graduate work during the coming year at the University of Kentucky.

Nathan M. Koffsky has been named Associate Head of the Division of Statistical and Historical Research, Bureau of Agricultural Economics.

Joseph W. Koudele, who has been doing research in poultry and egg marketing at Kansas State College, will be on leave, effective September 1, for graduate study at Michigan State College.

Ellis W. Lamborn has resigned his position on the staff of the Utah State Agricultural College to accept an appointment with the Foundation for Economic Education of New York.

Arnold B. Larson, who has been engaged in graduate study in Agricultural Economics and Statistics at the University of Minnesota, has been appointed Analytical Statistician, Army Air Service.

Jerry M. Law, assistant professor at the University of Arkansas, is on leave of absence to engage in graduate studies at the University of Minnesota.

Charles Elson Lively, Professor and Chairman of the Department of Rural Sociology at the University of Missouri, is the Director of the newly established Institute for Research in the Social Sciences at that university.

Carl C. Malone has been granted a leave of absence from Iowa State College, beginning September 1, to serve as an advisor at the University of Wales.

Alden C. Manchester, formerly of Harvard University and the Bureau of Agricultural Economics, has been appointed Executive Secretary of the New England Research Council on Marketing and Food Supply with headquarters in Boston.

C. G. McBride, a staff member of the Department of Agricultural Economics and Rural Sociology at Ohio State University since 1922, died of a heart attack on June 9, 1951.

John McCoy, Assistant Professor of Grain Marketing at Kansas State College, will do graduate work at the University of Wisconsin during the coming year.

J. B. McNulty, who has been Extension Economist at the University of Minnesota, retired on July 1.

Kenneth W. Meinken has returned to the Division of Statistical and Historical Research, Bureau of Agricultural Economics, from educational leave at Rutgers University Graduate School.

James F. Miles was awarded his Ph.D. degree at Cornell University in January. He is on the staff at Clemson Agricultural College, Clemson, South Carolina.

The first joint meeting of the Missouri Basin Inter-Agency Committee and the Columbia Basin Inter-Agency Committee was held on the campus of Montana State College May 24-25. Major speakers included O. V. Wells, Chief of the Bureau of Agricultural Economics and R. R. Renne, President, Montana State College.

Q. M. Morgan, formerly at Texas A. & M. Station, has joined the staff of the Division of Farm Management and Costs, Bureau of Agricultural Economics, where he will work on farm labor problems.

Joe R. Motheral, associate professor, Texas A. & M. College, has been awarded a Ph.D. degree in agricultural economics by the University of Wisconsin.

Mardy Myers has transferred from the Division of Statistical and Historical Research, Bureau of Agricultural Economics, to the Division of Dairy Statistics of the Bureau.

Harold C. Pederson has been appointed Extension Economist in Marketing, University of Minnesota.

Chester Peters, Assistant Dean of the School of Arts and Sciences at Kansas State College, will pursue graduate study in agricultural economics at the University of Wisconsin during the coming year.

Kenneth Peterson, assistant professor at Ohio State University, resigned June 1 to enter the employment of the Ohio Farm Bureau grain department.

Perry F. Philipp, who received his Ph.D. degree from the University of California last January, returned to the University of Hawaii as Acting Head of the Department of Agricultural Economics for 1951.

Wilfred H. Pine returned to Kansas State College July 1 after spending a year and a half with ECA in Ankara, Turkey.

Jeanne L. Ratliff has transferred from the Bureau of Agricultural Economics to the Bureau of Human Nutrition and Home Economics.

M. L. Remund, formerly graduate assistant in the Agricultural Economics Department at South Dakota State College, has been appointed assistant professor.

R. R. Renne, Montana State College, has been appointed to the 15-member National Manpower Council, set up by President Eisenhower of Columbia University to undertake continuing studies of the nation's manpower requirements. The work of the Council is financed by a grant from the Ford Foundation.

Harold M. Riley, assistant professor at Kansas State College, has been granted leave of absence to engage in graduate study in agricultural economics at Michigan State College.

F. M. Schrader has returned to the Canadian Department of Agriculture after receiving his Ph.D. degree at the University of Illinois in June.

Geoffrey Shepherd, of Iowa State College, left June 26 for a stay of five weeks in Japan as advisor to the Japanese Ministry of Agriculture concerning agricultural price policy. He will work with a special committee on formulas and procedures for setting the official price of rice. He will also deal with long range price and income problems and give lectures on methods of price analysis at several universities.

Will W. Simmons has accepted a position as agricultural specialist with the Poultry Branch of PMA in Washington, D. C. He has been employed as Cooperative Agent in the PMA and has been doing research at Cornell University.

Hugh Smith is interrupting study at Cornell University for his Ph.D. degree for Army duty as a First Lieutenant. He was formerly with the Farm Credit Administration in Florida and with the Fruit and Vegetable Branch of PMA in Washington, D. C.

Limen T. Smythe returned in June to his position as Associate Professor of Economics at South Dakota State College after having been on leave of absence for a school year to continue graduate study at Iowa State College.

Harold B. Sorenson has joined the staff of the Department of Agricultural Economics and Rural Sociology at Texas A. & M. College as associate professor. He replaces Kenneth J. Fugett, who has been recalled to active duty in the Air Force.

J. Hoyle Southern is on a year's assignment to the Food and Agriculture Organization of the United Nations. At the end of the assignment, he will return to his work with the Division of Land Economics, Bureau of Agricultural Economics, at College Station, Texas.

Robert P. Story, assistant professor at the University of Vermont and State Agricultural College, has been granted a leave of absence for work on his Ph.D. degree at Cornell University.

H. R. Stucky, extension economist, Montana State College, has returned to his duties after two quarters at the University of Minnesota, where he completed preliminary requirements for his Ph.D. degree.

Superior Service Awards were received by George Scott, State Statistician of California; George Edler of Agricultural Estimates; and Caroline B. Sherman of Economic Information, Bureau of Agricultural Economics.

Robert Suter was awarded his Ph.D. degree at Cornell University in January and joined the staff at the University of Missouri as Assistant Professor in Farm Management.

Maurice C. Taylor, associate professor at Montana State College, will spend the summer attending the Swift and Company Training School and the Summer Session at the University of Chicago.

Layton S. Thompson, Associate Professor of Agricultural Economics, Montana State College, returned to his duties after a year spent at Michigan State College, where he completed preliminary requirements for his Ph.D. degree.

Philip Van Vlack has been granted a year's leave of absence from his position as Assistant Professor of Economics at South Dakota State College to continue graduate work at Columbia University.

Donald Watson, formerly of Cornell University, has a position as Marketing Research Analyst in the Executive Department of General Electric at Schenectady, New York.

D. B. Williams, post-doctoral fellow at the University of Illinois, has returned to Australia after three years of study in the United States.

Karl T. Wright has been granted a year's leave of absence from Michigan State College, beginning July 1, to work with British economists on research methods in economics of production under the technical assistance program of ECA. He will be stationed at the University of Nottingham, but will work with the research men in the various research centers throughout the country.

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